Scientific Excellence • Resource Protection & Conservation • Benefits for Canadians
Excellence scientifique • Protection et conservation des ressources • Bénéfices aux Canadiens

The Salmon Escapement Database and Reporting System

Greg Serbic

Biological Sciences Branch
Department of Fisheries and Oceans
Pacific Biological Station
Nanaimo, British Columbia V9R 5K6

1991

Canadian Technical Report of Fisheries and Aquatic Sciences 1791

Fisheries and Oceans Pêches et Océans

Canada

91-04926/

Canadian Technical Report of Fisheries and Aquatic Sciences

Technical reports contain scientific and technical information that contributes to existing knowledge but which is not normally appropriate for primary literature. Technical reports are directed primarily toward a worldwide audience and have an international distribution. No restriction is placed on subject matter and the series reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries and aquatic sciences.

Technical reports may be cited as full publications. The correct citation appears above the abstract of each report. Each report is abstracted in *Aquatic Sciences and Fisheries Abstracts* and indexed in the Department's annual index to scientific and technical publications.

Numbers 1–456 in this series were issued as Technical Reports of the Fisheries Research Board of Canada. Numbers 457–714 were issued as Department of the Environment, Fisheries and Marine Service, Research and Development Directorate Technical Reports. Numbers 715–924 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Technical Reports. The current series name was changed with report number 925.

Technical reports are produced regionaliy but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page. Out-of-stock reports will be supplied for a fee by commercial agents.

Rapport technique canadien des sciences halieutiques et aquatiques

Les rapports techniques contiennent des renseignements scientifiques et techniques qui constituent une contribution aux connaissances actuelles, mais qui ne sont pas normalement appropriés pour la publication dans un journal scientifique. Les rapports techniques sont destinés essentiellement à un public international et ils sont distribués à cet échelon. Il n'y a aucune restriction quant au sujet; de fait, la série reflète la vaste gamme des intérêts et des politiques du ministère des Pêches et des Océans, c'est-à-dire les sciences halieutiques et aquatiques.

Les rapports techniques peuvent être cités comme des publications complètes. Le titre exact paraît au-dessus du résumé de chaque rapport. Les rapports techniques sont résumés dans la revue *Résumés des sciences aquatiques et halieutiques*, et ils sont classés dans l'index annual des publications scientifiques et techniques du Ministère.

Les numéros 1 à 456 de cette série ont été publiés à titre de rapports techniques de l'Office des recherches sur les pêcheries du Canada. Les numéros 457 à 714 sont parus à titre de rapports techniques de la Direction générale de la recherche et du développement, Service des pêches et de la mer, ministère de l'Environnement. Les numéros 715 à 924 ont été publiés à titre de rapports techniques du Service des pêches et de la mer, ministère des Pêches et de l'Environnement. Le nom actuel de la série a été établi lors de la parution du numéro 925.

Les rapports techniques sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page du titre. Les rapports épuisés seront fournis contre rétribution par des agents commerciaux.

Canadian Technical Report of
Fisheries and Aquatic Sciences 1791

1991

THE SALMON ESCAPEMENT DATABASE AND REPORTING SYSTEM

by

Greg Serbic

Biological Sciences Branch
Department of Fisheries and Oceans
Pacific Biological Station
Nanaimo, British Columbia V9R 5K6

(c)Minister of Supply and Services Canada 1991

Cat. No. Fs 97-6/1791E ISSN 0706-6457

Correct citation for this publication:

Serbic, G. 1991. The Salmon Escapement Database and Reporting System. Can. Tech. Rep. Fish. Aquat. Sci. 1791: 104 p.

TABLE OF CONTENTS

Page

LIST OF FIGURES vi

LIST OF TABLES viii

ABSTRACT ix

PREFACE x

INTRODUCTION 1

CHAPTER 1 OVERVIEW OF THE SALMON ESCAPEMENT REPORTING SYSTEM 6
1.1 REPORTING SYSTEM COMPONENTS (OVERVIEW) 6
1.2 ACCESSING THE SALMON ESCAPEMENT DATA SYSTEM 8

CHAPTER 2 DATABASE MANAGEMENT 9
2.1 DATA COLLECTION 9
2.1.1 History 9
2.1.2 Current Procedure 10
2.2 DATA ENTRY AND VERIFICATION 12
2.3 MAINTENANCE PROCEDURES 13
2.3.1 Stream master maintenance routine 13
2.3.2 Escapement data maintenance routine 13

CHAPTER 3 THE STREAM MASTER SYSTEM 14
3.1 ORIGIN OF THE WATERSHED-CODING SYSTEM 14
3.2 INTERPRETATION OF THE WATERSHED-CODING SYSTEM 17

CHAPTER 4 REPORT GENERATION MODULE 19
4.1 PERUSE MODE 19
4.2 REPORT DESIGN MODULE 19
4.3 REPORT RESTRICTIONS SCREEN 20
4.3.1 Rabcode report restrictions screen 20
4.3.2 Statistical area report restrictions screen 24
4.3.3 User-defined group report restrictions screen 26

CHAPTER 5 ESCAPEMENT QUERY MODULE 28
5.1 STREAM NAME SCREEN 29
5.2 RABCODES SCREEN 29
5.3 RUN TIMING AND ESCAPEMENTS SCREEN 30
5.4 FLOWS INTO SCREEN 31
5.5 STREAM TRIBUTARIES SCREEN 32
5.6 SUBDISTRICT STREAM SURVEY SCREEN 32
5.7 ALL ESCAPEMENTS SCREEN 33
5.8 STREAM HISTORY SCREEN 34

CHAPTER 6 STREAM GROUP CREATION AND MAINTENANCE MODULE 37
6.1 STREAM GROUP MAINTENANCE 37
6.2 CREATING GROUPS 38

TABLE OF CONTENTS (CON'T)

		Page
6.2.1	Group Type 1: Rabcode-Range	39
6.2.2	Group Type 2: Mainstem	40
6.2.3	Group Type 3: Statistical Area(s)	41
6.2.4	Group Type 4: Individual Rabcode(s)	42
6.3	EXAMINING GROUPS	46
6.4	MODIFYING GROUPS	47
6.5	DELETING GROUPS	47
6.6	COMPARING GROUPS	47
CHAPTER 7	SPECIAL REPORTS MODULE	49
7.1	ESCAPEMENT RANK	49
7.2	RUN TIMING	52
7.3	PERCENTAGE CONTRIBUTION	54
7.4	ESCAPEMENT EXCEPTION	56
7.5	ESCAPEMENT CLASSIFICATION	58
7.6	ESCAPEMENT AVERAGES	61
7.7	EXAMPLES	63
CHAPTER 8	SUBROUTINE OVERVIEW	65
8.1	BRIEF DESCRIPTION OF SUBROUTINES	65
8.2	SUBROUTINES	67
	Openstrmast	67
	Openbc16	68
	Openrollup	69
	Openesconly	70
	Readstrmast	71
	Readbc16	72
	Clearreportcom	74
	Removedash	75
	Insertdash	76
	Onerabesc	77
	Fndallstr	78
	Getsubdstrs	79
	Subdesc	80
	Inspections	81
	Getmethods	82
	Getoptimum	83
	Cycles	84
	Spawndates	85
	Maxmin	86
	Validsubd	87
	Getdistrict	88
	Checkrab	89
	Calcavg	90
	Gettribs	91
	Getrangerabs	92

TABLE OF CONTENTS (CON'T)

Page

APPENDIX A ESCAPEMENT FILES 93
A.1 STREAM MASTER FILE 93
A.1.1 File Structure 93
A.1.2 Field Descriptions 93
A.2 ANNUAL BC16 ESCAPEMENT FILES 94
A.2.1 File Structure 95
A.2.2 Field Descriptions 95
A.3 SUBDISTRICT ROLLUP FILE 98
A.4 STREAM HISTORY FILE 100
A.4.1 File Structure 100
A.5 ESCAPEMENTS ONLY FILE 101
A.5.1 File Structure 101

APPENDIX B COMMON BLOCKS 102
B.1 INTRODUCTION 102
B.2 STREAM MASTER COMMON BLOCK 102
B.3 BC16 COMMON BLOCK 102
B.4 REPORT GENERATOR COMMON BLOCK 103

REFERENCES 104

LIST OF FIGURES

Page

Figure 0.1 - Annual report of Salmon streams and Spawning populations... 3
Figure 0.2 - Federal Fisheries subdistricts..... 4
Figure 0.3 - Conservation districts..... 5
Figure 1.1 - Salmon stock assessment Access Menu..... 8
Figure 1.2 - Reporting System Main Menu..... 8
Figure 2.1 - Stream visitation form..... 11
Figure 2.2 - BC16 data-entry screen..... 12
Figure 3.1 - Major watersheds and code numbers..... 16
Figure 3.2 - Pictorial example of the watershed coding hierarchy..... 18
Figure 4.1 - Report design screen example..... 20
Figure 4.2 - Rabcode report restrictions screen..... 21
Figure 4.3 - Example of a generated table..... 22
Figure 4.4 - Rabcode report restrictions example..... 23
Figure 4.5 - Rabcode report example..... 24
Figure 4.6 - Statistical area report restrictions example..... 25
Figure 4.7 - Statistical area report example..... 25
Figure 4.8 - User-defined group report restrictions example..... 26
Figure 4.9 - User-defined group report example..... 27
Figure 5.1 - Main query screen..... 28
Figure 5.2 - Stream name query screen..... 29
Figure 5.3 - Rabcodes query screen..... 29
Figure 5.4 - Run-timing and escapements query example..... 30
Figure 5.5 - Flows into query example..... 31
Figure 5.6 - Stream tributaries query example..... 32
Figure 5.7 - Subdistrict stream survey example..... 32
Figure 5.8 - All escapements example..... 33
Figure 5.9 - Stream history query example..... 34
Figure 5.10- Management divisions..... 36
Figure 6.1 - Stream group maintenance module..... 37
Figure 6.2 - Stream group maintenance example..... 38
Figure 6.3 - Rabcode-range group creation example..... 39
Figure 6.4 - Mainstem group creation example..... 40
Figure 6.5 - Statistical area group creation example..... 41
Figure 6.6 - Grouping by individual streams screen..... 42
Figure 6.7 - Stream name display from rabcode entry example..... 43
Figure 6.8 - Stream segment match display..... 43
Figure 6.9 - Stream selection display example..... 44
Figure 6.10- Stream group summary report example..... 45
Figure 6.11- Examining a stream group example..... 46
Figure 6.12- Stream group comparison report example..... 48
Figure 7.1 - Special reports module..... 49
Figure 7.2 - Escapement rank report restrictions screen example..... 50
Figure 7.3 - Stream rank report by total escapement example..... 51
Figure 7.4 - Run-timing report restrictions screen example..... 52
Figure 7.5 - Run-timing report example..... 53
Figure 7.6 - Percentage contribution report restrictions screen example. 54
Figure 7.7 - Percentage contribution report example..... 55
Figure 7.8 - Listing of all coho streams example..... 55
Figure 7.9 - Contribution report by ranked streams example..... 56

LIST OF FIGURES (CON'T)

Page

Figure 7.10- Escapement exception report restrictions screen example.... 56
Figure 7.11- Coho escapement exception report example..... 57
Figure 7.12- Escapement classification report restrictions screen example 58
Figure 7.13- Example of coho classification report for class - small.... 59
Figure 7.14- Example of coho classification report for class - medium... 60
Figure 7.15- Example of coho classification report for class - large.... 60
Figure 7.16- Escapement averages report restrictions screen example..... 61
Figure 7.17- Escapement averages report example..... 62
Figure A.1 - Format of the Stream Master file..... 93
Figure A.2 - Format of the BC16yy.dat files..... 95
Figure A.3 - Format of the Additional run file..... 97
Figure A.4 - Subdistrict index table..... 99
Figure A.5 - Format of the Stream History file..... 100
Figure A.6 - Format of the Escapements Only file..... 101

LIST OF TABLES

Page

Table 1 - Top down structure of the Salmon Escapement System..... 7
Table 2 - Escapement letter-code translation..... 9
Table 3 - Major catchment areas of salmon spawning streams..... 15
Table 4 - Example of the watershed coding hierarchy..... 17

ABSTRACT

Serbic, G. 1991. The Salmon Escapement Database and Reporting System. Can. Tech. Rep. Fish. Aquat. Sci. 1791: 104 p.

This manual documents the Salmon Escapement Database and Reporting System (S.E.D.S.) and procedures for extracting information from it. The reporting system is designed to maximize report flexibility while minimizing operation complexity. A discussion of the origin and interpretation of the watershed-coding system is provided, as well as a description of the database fields, file structures and library subroutines.

The database consists of escapement and run-timing information as provided by Departmental field staff on Annual Reports of Salmon Streams and Spawning Populations. The escapement estimates reflect only wild returns to spawning grounds. The database also includes information on start, peak, and end of spawning, stream inspection dates, enumeration methods, and reliabilities of escapement estimates.

RÉSUMÉ

Serbic, G. 1991. The Salmon Escapement Database and Reporting System. Can. Tech. Rep. Fish. Aquat. Sci. 1791: 104 p.

Ce manuel présente le système de base de données et production de rapports sur l'échappée des saumons (S.E.D.S.) et décrit les procédures pour l'extraction des informations qu'il renferme. Ce système a été conçu de façon à assurer le maximum de souplesse dans les rapports et à ce qu'il soit le plus simple possible à exploiter. La manière dont a été créé et doit être interprété le système de codage des bassins hydrographiques est décrite, de même que les champs de la base de données, les structure des fichiers et les sous-programmes de bibliothèque.

La base de données renferme des informations sur l'échappée et les périodes de remonte fournies par le personnel du ministère oeuvrant sur le terrain et qui apparaissent dans les rapports annuels sur les rivières à saumons et les populations de géniteurs. Les estimations de l'échappée n'ont trait qu'aux remontes de saumons sauvages vers les frayères. La base de données renferme aussi des informations sur le début, la période de pointe et la fin de la fraye, les dates d'inspection des cours d'eau, les méthodes de dénombrement et la fiabilité des estimations de l'échappée.

PREFACE

I became involved with Salmon Escapement data in 1983. At that time, the Pacific Biological Station (PBS) was the central repository for all Annual Reports of Salmon Streams and Spawning Populations. Subdistrict staff would complete annual reports and forward them to PBS, where a comprehensive collection continues to be maintained. Verifying the accuracy and completeness was a very time-consuming task. In addition, generating escapement summaries spanning various subdistricts and years required considerable effort and was prone to error. To overcome these difficulties, the Department decided to develop a computerized escapement database.

A service bureau, Comshare, was commissioned to develop a database and reporting system that met DFO specifications. Linda Aaloe, Fred Wong, Louis Lapi, and myself were involved in the development of these specifications. In particular, my immediate supervisor Fred Wong helped me face many of the difficulties that arose during the development of this database. Sadly, his untimely death in 1985 prevented him from seeing the project reach its current stage of development.

The Comshare system became operational in 1985 and was based on a user-pay accounting system. The host computer was located in Toronto and access was via telephone lines. Due to the high costs of data storage, report generation, and communication, the decision was made to develop an escapement database and reporting system at PBS.

In 1986, I was given the task of designing and developing a database that would more completely meet the needs of DFO's user-community. The database described here is the culmination of this effort. Perhaps a dozen person years have been spent compiling these escapement estimates on the PBS computer. Gail Hudson, Louis Lapi, and Maureen Holmes each played a significant role in implementing and supervising the required procedures. I particularly acknowledge Gail Hudson, both for her role as liason between DFO personnel and for her continuing involvement and dedication to the laborious task of data management.

I thank Jon Schnute, a resident PBS scientist, who provided considerable assistance in the development of this technical report. His comments and suggestions have greatly enhanced the readability of this document. I also wish to thank the many Departmental field staff involved in the collection of escapement data. Without their work, there would be no escapement database.

INTRODUCTION

After spending the majority of their lives in the ocean, Pacific salmonids migrate back to their river of origin to reproduce (spawn). The number that survive natural mortality and avoid being caught in the commercial, sport, and native food fisheries is termed the spawning escapement.

Predictions of the numbers of fish that will return in the next generation are partly based on escapement estimates obtained during the spawning season. With the goal of optimizing the number of fish that will return per spawner (i.e., recruits per spawner), these predictions influence the opening and closing of commercial fisheries.

The most reliable procedure for enumeration is the counting fence. Counting fences, however, are expensive and impractical for many systems. Consequently, based on geographic and monetary constraints, other enumeration methods are used. Different methods have different accuracies. Hence, the accuracy of spawning estimates varies between streams employing different estimation procedures.

A variety of different methods exist for estimating spawning populations. Some of the most common methods are:

1) the use of fixed-wing aircraft or helicopter to obtain aerial estimates;
2) the use of watercraft (boats, rubber rafts, etc) and dive surveys to obtain float counts;
3) walking an extent of a stream or observing from a stationary location to obtain land estimates;
4) the use of man-made barriers (counting fences) to electronically or visually count salmon migrating to spawning grounds.

The reliabilities of spawning estimates are also subject to within stream variability. Other than environmental factors (e.g., visibility due to weather conditions), a number of events can occur that introduce non-quantifiable inconsistencies in year to year estimates. Some of these sources of variation pertain to:

1) **Field staff** (e.g., an experienced enumerator is replaced by one who is new to procedures);
2) **Enumeration method** (e.g., the method of estimation is changed due to a change in funding or field staff);
3) **Intensity of inspection** (e.g., the number of stream visits taken to arrive at an annual estimate changes due to a change in manpower);
4) **Dates of inspection** (e.g., the dates on which the stream was inspected change because of weather conditions);
5) **Method of reporting annual escapements** (e.g., the reported annual escapement changes from including brood stock to excluding brood stock).

Many of these non-environmental events that can effect year to year changes in the reliabilities of spawning estimates are not documented. As a result, comparison of annual escapement estimates between, and within, streams must proceed with caution. Users wishing to compare estimates are advised to research the accuracy and consistency of escapement measurement. In many

instances, escapement estimates are useful only as indicators of growth or decline of salmon populations.

Since the early 1930s, the number of salmon that have returned to freshwater for reproduction have been estimated by Departmental field staff and recorded on Annual Reports of Salmon Streams and Spawning Populations (Figure 0.1). The information reported on an Annual Report consists of:

1) the stream's rabcode (see Chapter 3.1);
2) the gazetted name and local names of the stream;
3) the receiving waters (i.e., the body of water into which the stream flows);
4) the subdistrict and district (Figures 0.2 & 0.3) where the stream is located;
5) the dates in which the stream was inspected;
6) the date each species arrived in the stream;
7) the date each species began to spawn;
8) the date of peak spawning for each species;
9) the date spawning ended for each species;
10) the number of visits on which each species was observed in the stream;
11) the methods used to estimate the number spawning for each species;
12) the reliability of the estimate for each species;
13) the estimated optimum escapement for each species;
14) an indication of whether unusual conditions were present during spawning;
15) a description of the physical conditions (e.g., evidence of erosion and water levels), biological conditions (e.g., distribution of spawning salmon and types of predation), and any special conditions that existed during the spawning period.

For a more complete description of the above information see Appendix A. For an in-depth description see (Anon. 1986).

Prior to 1984, subdistrict records were centralized in their respective district offices. Consequently, management plans spanning various districts required significant time for data compilation. To overcome these difficulties, the Department decided to develop a computerized escapement database system.

Analyses of fishery data for stock assessment, research, management, enhancement impact and international negotiations often require information from many sources. (e.g., catch, escapement and coded-wire tag information). As an integral part of the databases for management and analyses, the Salmon Escapement Data System (SEDS) was developed on the PBS VAX computer. SEDS offers the following features:

1) All the information on an Annual Report of Salmon Streams and Spawning Populations (Figure 0.1) is captured, with comments constituting their own database.
2) Independence between application program and database management is achieved because all application programs are "buffered" by database subroutines.
3) Linkage to other data systems, such as commercial catch (Wong 1983) and coded-wire tagging (Kuhn et al. 1988) can be done easily via database subroutines.

DEPARTMENT OF FISHERIES AND OCEANS

ANNUAL REPORT OF SALMON STREAMS AND SPAWNING POPULATIONS

STREAM IDENTIFICATION

DATES OF INSPECTION

SPAWNING RUN TIMING AND ESTIMATED NUMBER (Instructions on flip side)

1 SPECIES	2 ARRIVAL IN STREAM	3 DATES OF DURATION OF SPAWNING START	PEAK	END	4 NO OF OBSRV	5 METHODS	6 RELIABILITY	7 EST TOT NO ON GROUNDS	8 OPTIMUM ESCAPEMENT
	Month Day	Month Day	Month Day	Month Day					
SOCKEYE 1									
SOCKEYE 2									
COHO 1									
COHO 2									
PINK 1									
PINK 2									
CHUM 1									
CHUM 2									
CHINOOK 1									
CHINOOK 2									

UNUSUAL CONDITIONS

MARK BOX FOR UNUSUAL CONDITIONS

- ☐ (A) Enhancement or intense biological activities
- ☐ (B) Unusual mortalities
- ☐ (C) Obstructions or changes in habitat with recommendations
- ☐ (D) Large variations in sex ratio or unusual number of jacks
- ☐ (E) Unusually high or low water flow level during spawning period

ADDITIONAL COMMENTS

PHYSICAL CONDITION OF SPAWNING GROUNDS

(A) Evidence of erosion and silting. Give extent or percent of stream bed affected

(B) Particulars of scouring of spawning beds or change in course of stream

(C) Water levels: flow normal, high, abnormal. If abnormal, details should be given

BIOLOGICAL CONDITIONS

(D) Particulars of distribution of spawning salmon over the stream bed

(E) Comments on predators

(F) Evidence of digging up eggs by later spawning fish

(G) New obstructions (nature and recommendations)

COMMENTS ON ANY OTHER CONDITIONS AFFECTING THIS STREAM

Signature

Fishery Officer / Person Preparing Report

Figure 0.1. Annual Report of Salmon Streams and Spawning Populations.

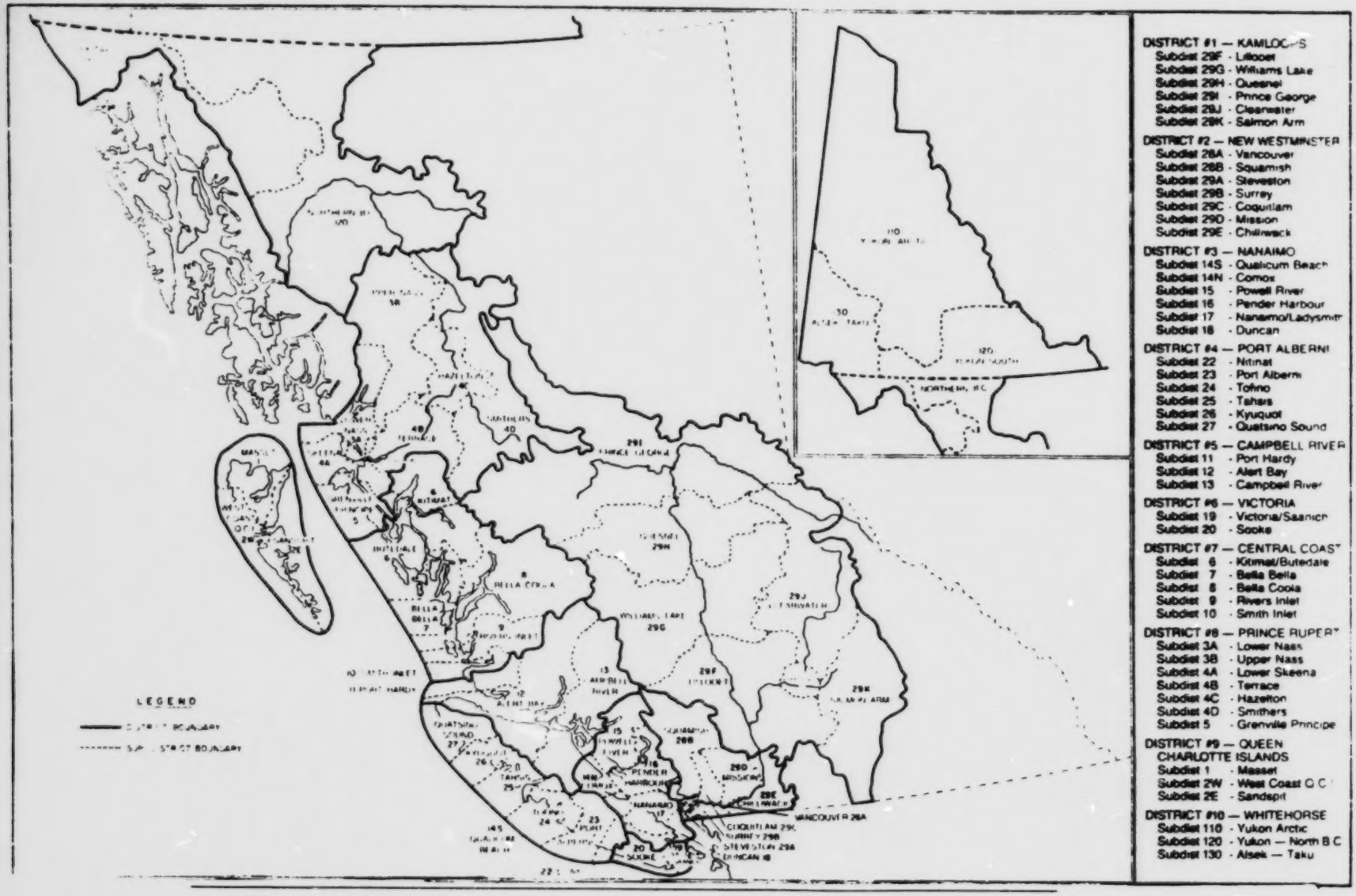

LEGEND
DISTRICT #1 — KAMLOOPS
Subdist 29F - Lillooet
Subdist 29G - Williams Lake
Subdist 29H - Quesnel
Subdist 29I - Prince George
Subdist 29J - Clearwater
Subdist 29K - Salmon Arm
DISTRICT #2 — NEW WESTMINSTER
Subdist 28A - Vancouver
Subdist 28B - Squamish
Subdist 29A - Steveston
Subdist 29B - Surrey
Subdist 29C - Coquitlam
Subdist 29D - Mission
Subdist 29E - Chilliwack
DISTRICT #3 — NANAIMO
Subdist 14S - Qualicum Beach
Subdist 14N - Comox
Subdist 15 - Powell River
Subdist 16 - Pender Harbour
Subdist 17 - Nanaimo/Ladysmith
Subdist 18 - Duncan
DISTRICT #4 — PORT ALBERNI
Subdist 22 - Nitinat
Subdist 23 - Port Alberni
Subdist 24 - Tofino
Subdist 25 - Tahsis
Subdist 26 - Kyuquot
Subdist 27 - Quatsino Sound
DISTRICT #5 — CAMPBELL RIVER
Subdist 11 - Port Hardy
Subdist 12 - Alert Bay
Subdist 13 - Campbell River
DISTRICT #6 — VICTORIA
Subdist 19 - Victoria/Saanich
Subdist 20 - Sooke
DISTRICT #7 — CENTRAL COAST
Subdist 6 - Kitimat/Butedale
Subdist 7 - Bella Bella
Subdist 8 - Bella Coola
Subdist 9 - Rivers Inlet
Subdist 10 - Smith Inlet
DISTRICT #8 — PRINCE RUPERT
Subdist 3A - Lower Nass
Subdist 3B - Upper Nass
Subdist 4A - Lower Skeena
Subdist 4B - Terrace
Subdist 4C - Hazelton
Subdist 4D - Smithers
Subdist 5 - Grenville Principe
DISTRICT #9 — QUEEN CHARLOTTE ISLANDS
Subdist 1 - Masset
Subdist 2W - West Coast Q C I
Subdist 2E - Sandspit
DISTRICT #10 — WHITEHORSE
Subdist 110 - Yukon Arctic
Subdist 120 - Yukon — North B C
Subdist 130 - Alsek — Taku

Figure 0.2. Federal fisheries subdistricts (Fish Habitat Inventory and Information Program. 1990)

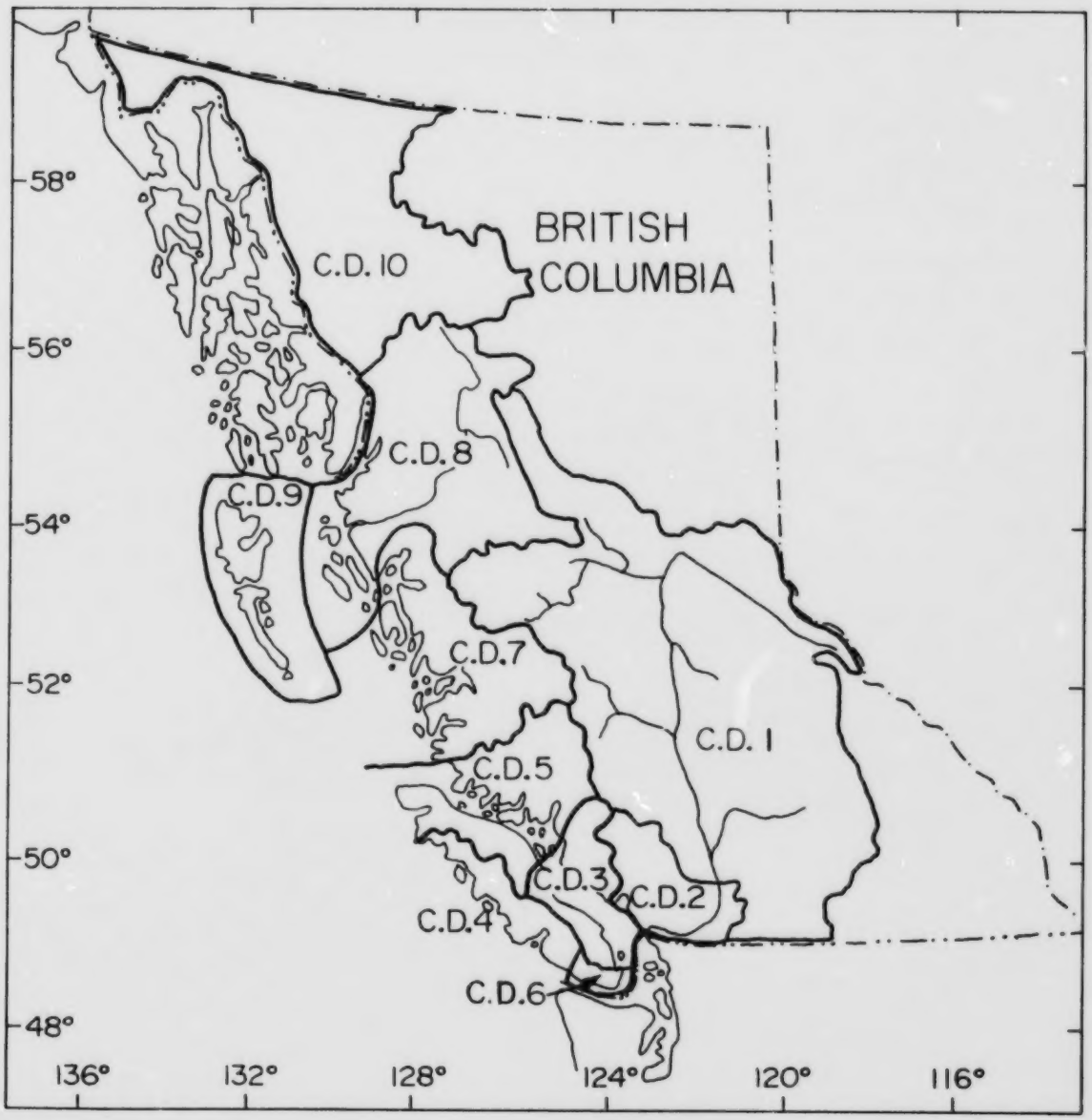


Figure 0.3. Conservation districts of British Columbia.

CHAPTER 1 OVERVIEW OF THE SALMON ESCAPEMENT REPORTING SYSTEM

1.1 REPORTING SYSTEM COMPONENTS (OVERVIEW)

The reporting system consists of the five basic modules listed below.

1) Report Design Module. This flexible report creation system provides operator-control over the output report format.

2) Escapement Query Module. This interactive query system permits retrieval of stream master and escapement information, based on other known information.

3) Stream Group Maintenance Module. This system allows for the creation and storage of stream groupings. Once created, the groups's name can be used in the report generation phase, eliminating the task of specifying each stream every time a report on this aggregate of streams is required.

4) Special Reports Module. Certain types of reports fall beyond the scope of the report design module. Classifying streams by escapement or determining percentage contributions of stream escapements to a group escapement are examples of two such reports. This module provides access to a number of these special reports.

5) Print Module. This module allows the user to print:

a) The Stream Master file. (Appendix A.1)
b) Any Subdistrict (Figure 0.2) subset of the Stream Master.
c) The Catchment Table. (Table 3)

Table 1 displays the system as a whole, showing the five main modules and their component sub-modules.

TABLE 1 - Top Down Structure of the Salmon Escapement System

Main Menu

1. Report Design Module
   - A. Rabcode Module
   - B. Statistical Area Module
   - C. User-defined Group Module

2. Escapement Query Module
   - A. Retrieve stream name given rabcode
   - B. Retrieve rabcode(s) given stream name
   - C. Retrieve escapements and run-timing given rabcode and year
   - D. Retrieve receiving waters given stream name and subdistrict
   - E. Retrieve tributaries given stream name and subdistrict
   - F. Retrieve all stream names and rabcodes given subdistrict
   - G. Retrieve all escapements given rabcode
   - H. Retrieve stream history given rabcode

3. Stream Group Maintenance Module
   - A. Create a stream group
   - B. Modify a stream group
     - a. Add streams
     - b. Delete streams
   - C. Delete a stream group
   - D. Examine a stream group

4. Special Reports Module
   - A. Escapement Rank Report
   - B. Percentage Contribution Report
   - C. Run Classification Report
   - D. Escapement Exception Report
   - E. Run-Timing Report
   - F. Species Present Report

5. Print Module
   - A. Print Stream Master
   - B. Print Subdistrict Streams
   - C. Print Catchment Table

1.2 ACCESSING THE SALMON ESCAPEMENT DATA SYSTEM

In order to access the Salmon Escapement Data System, the user must be logged on to the PBS VAX computer. This requires that the user have a Vax account. If an account does not exist, authorization and additional information needed to gain access to the VAX can be obtained from the PBS computing staff. Once logged on to the PBS VAX, the user types SSA and hits <RETURN>. The following menu should appear:

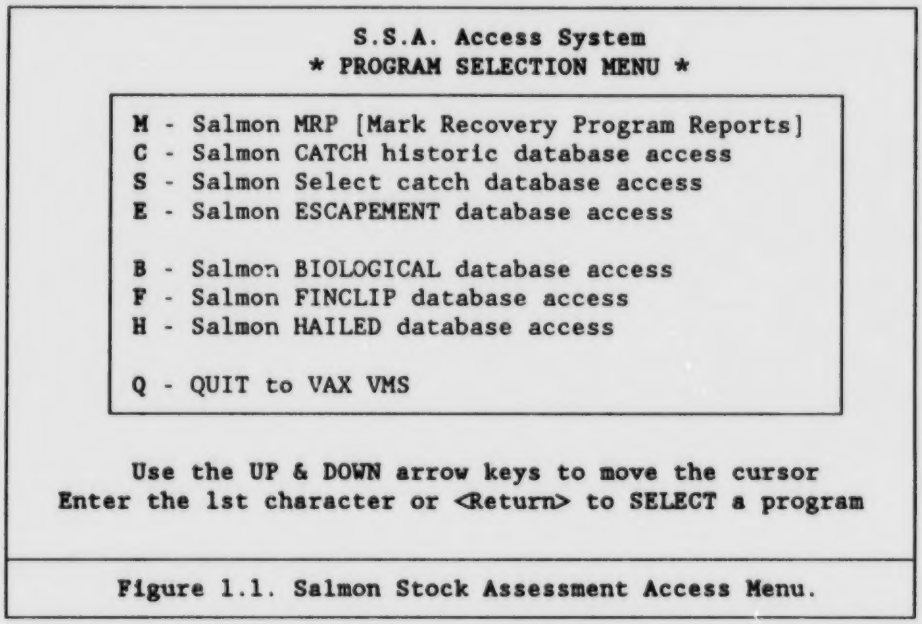

S.S.A. Access System
* PROGRAM SELECTION MENU *
M - Salmon MRP [Mark Recovery Program Reports]
C - Salmon CATCH historic database access
S - Salmon Select catch database access
E - Salmon ESCAPEMENT database access
B - Salmon BIOLOGICAL database access
F - Salmon FINCLIP database access
H - Salmon HAILED database access
Q - QUIT to VAX VMS
Use the UP & DOWN arrow keys to move the cursor
Enter the 1st character or <Return> to SELECT a program

Figure 1.1. Salmon Stock Assessment Access Menu.

The user either types in the letter E or hits the down arrow 3 times to place the cursor bar over **Salmon ESCAPEMENT database access** and then hits <RETURN>. Either method results in the SALMON ESCAPEMENT REPORTING SYSTEM MAIN MENU (Figure 1.2) being displayed. (NOTE:To bypass the above menu and go directly to the SALMON ESCAPEMENT MAIN MENU, the user can type SSA E).

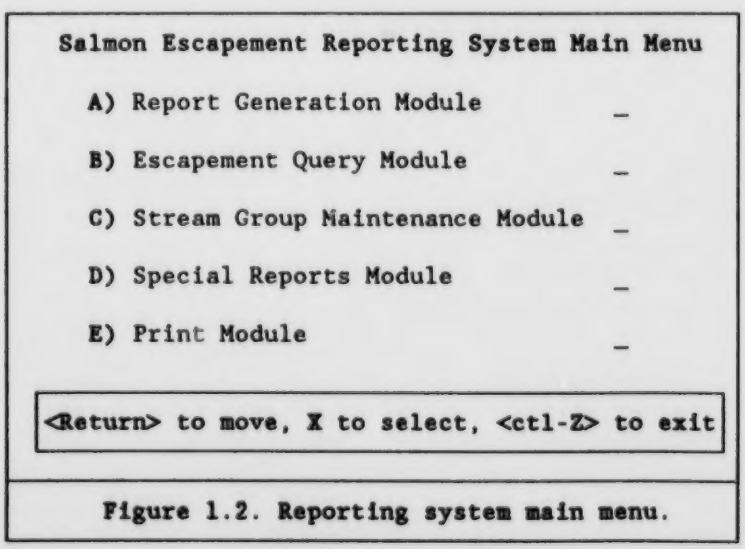

Salmon Escapement Reporting System Main Menu
A) Report Generation Module
B) Escapement Query Module
C) Stream Group Maintenance Module
D) Special Reports Module
E) Print Module
<Return> to move, X to select, <ctl-Z> to exit

Figure 1.2. Reporting system main menu.

CHAPTER 2 DATABASE MANAGEMENT

A database is simply a collection of information. It's value necessarily depends on the quality of information that it contains. The current status of a database is a function of the on-going thoroughness of the three processes inherent in its evolution: data collection, data-entry and data-maintenance. In an effort to maintain the quality and the integrity of SEDS, procedures have been developed that determine the completeness of each subdistrict's submissions, verify data-fields to minimize invalid information from entering the database, and check user-privileges to insure that only authorized users modify existing data.

2.1 DATA COLLECTION

2.1.1 History

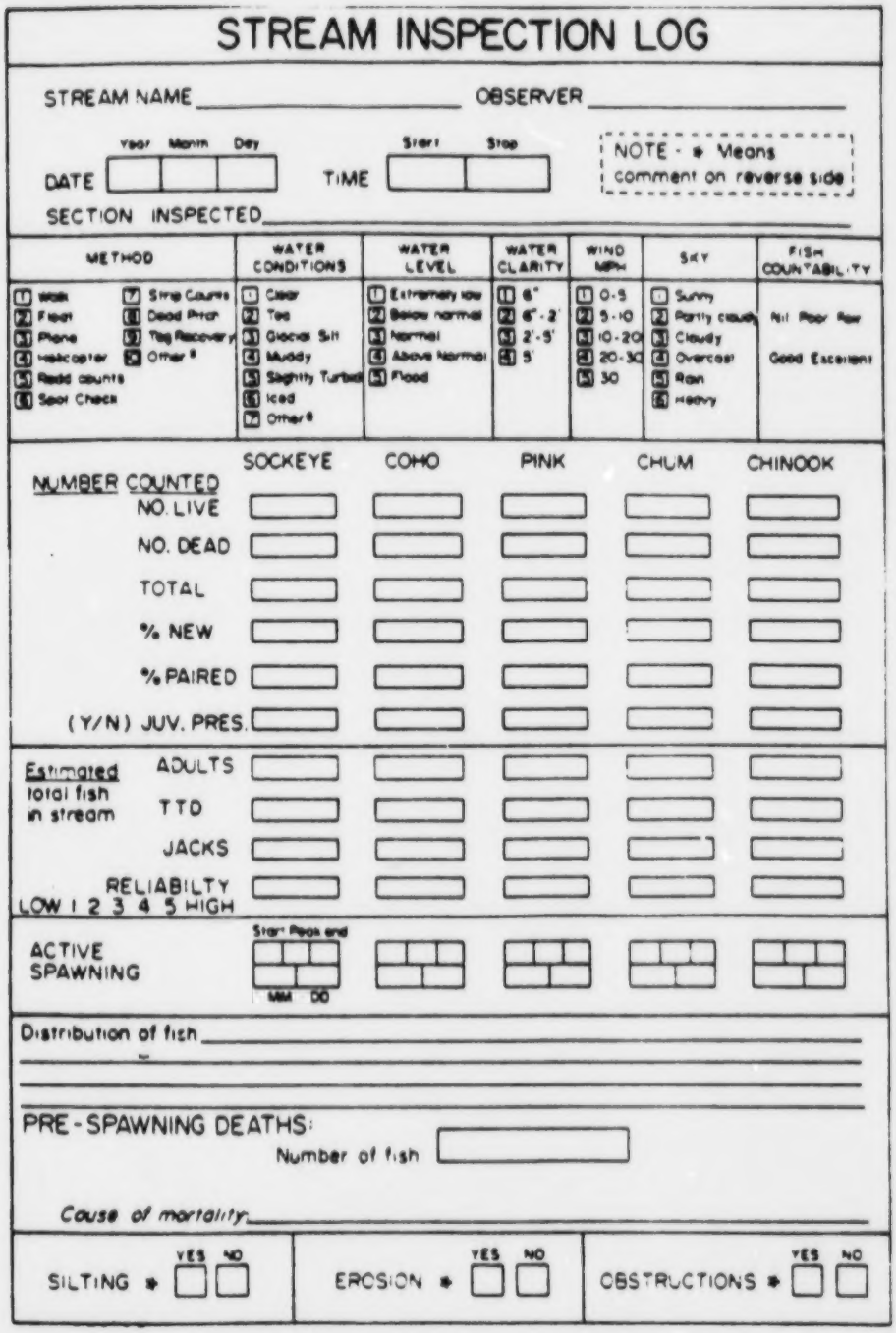
As early as the 1920s, Departmental field staff have been monitoring escapement. Originally, escapement runs were classified as small, medium or large relative to an 'average' spawning year for each creek. In the 1930s, actual estimates began to be recorded. An escapement estimate takes one of two formats. It is either an integer or it is a letter code. A letter code represents a range of escapements (Table 2). Since the SEDS system accomodates only numeric estimates, letter codes must be translated into numbers before they can be entered into the system. Unless qualifying information exists, the midpoint of the range represented by the letter code is used as the escapement estimate.

Table 2. Escapement letter-code translation

ESTIMATE	RANGE	MIDPOINT
A	1-50	25
B	50-100	75
C	100-300	150
D	300-500	450
E	500-1000	750
F	1000-2000	1500
G	2000-5000	3500
H	5000-10000	7500
K	10000-20000	15000
L	20000-50000	35000
M	50000-100000	75000
N	OVER 100000	treated individually

2.1.2 Current Procedure

Currently, Departmental field staff complete a stream visitation form (Figure 2.1) each time a stream is inspected. Factors affecting escapement estimates such as the method of inspection, water conditions, water level and water clarity are reported together with the actual number of fish seen and the estimated number in the stream. At the end of the spawning season, an Annual Report of Salmon Streams and Spawning Populations, commonly known as a BC16, is compiled from the individual stream visits. These forms are stored in their respective subdistrict offices and a copy forwarded to the Pacific Biological Station (PBS) where a comprehensive collection is maintained.



STREAM INSPECTION LOG

STREAM NAME _____ OBSERVER _____

DATE (Year Month Day) TIME (Start Stop)

NOTE - * Means comment on reverse side

SECTION INSPECTED _____

METHOD	WATER CONDITIONS	WATER LEVEL	WATER CLARITY	WIND MPH	SKY	FISH COUNTABILITY
1 Walk 2 Float 3 Plane 4 Helicopter 5 Redd counts 6 Spot Check 7 Strip Counts 8 Dead Pitch 9 Tag Recovery 10 Other *	1 Clear 2 Tea 3 Glacial Silt 4 Muddy 5 Slightly Turbid 6 Iced 7 Other *	1 Extremely low 2 Below normal 3 Normal 4 Above Normal 5 Flood	1 6" 2 6"-2' 3 2'-5' 4 5'	1 0-5 2 5-10 3 10-20 4 20-30 5 30	1 Sunny 2 Partly cloudy 3 Cloudy 4 Overcast 5 Rain 6 Heavy	Nil Poor Fair Good Excellent

NUMBER COUNTED	SOCKEYE	COHO	PINK	CHUM	CHINOOK
NO. LIVE					
NO. DEAD					
TOTAL					
% NEW					
% PAIRED					
(Y/N) JUV. PRES.					

Estimated total fish in stream	SOCKEYE	COHO	PINK	CHUM	CHINOOK
ADULTS					
TTD					
JACKS					
RELIABILTY LOW 1 2 3 4 5 HIGH					

ACTIVE SPAWNING	SOCKEYE	COHO	PINK	CHUM	CHINOOK
Start Peak end (MM DD)					

Distribution of fish _____

PRE-SPAWNING DEATHS:

Number of fish _____

Cause of mortality _____

SILTING *	EROSION *	OBSTRUCTIONS *
YES NO	YES NO	YES NO

Figure 2.1. An example of a stream visitation form.

2.2 DATA ENTRY AND VERIFICATION

Two methods currently exist for incorporating the data into the system:

1) The Annual Reports are sent out for keypunching and the resulting data file is passed through a computerized data-verification program. Records that have no data violations are loaded into the system. Records with invalid data are rejected and the errors highlighted to facilitate correction. Correction of non-obvious errors is subsequently done in conjunction with appropriate subdistrict personnel.

2) The Annual Reports are entered by an operator using the BC16 data-entry screen (Figure 2.2). All of the information on an Annual Report is captured, with comments constituting their own database.

Method (2) is preferable as all fields are extensively error-checked at data-entry time, minimizing the amount of time required for error correction. (Note: Prior to any escapement data being entered for a given spawning year (yy), a file BC16yy.dat is constructed with all escapements for all creeks set to -3 (i.e., no report). As Annual Reports are received, the -3's are replaced).

Enter Rabcode: Enter year:

Gazetted Name: District:

Local Name: Subdistrict:

Inspection Dates: First Inspected: Last Inspected:

Species	Arrival In Stream	Duration of spawning Start	Peak	End	# OBS	Methods	Reliab.	Est. Esc.	Opt. Esc.
Sockeye: Run 1									
Coho: Run 1									
Pink: Run 1									
Chum: Run 1									
Chinook: Run 1									

Figure 2.2. BC16 data-entry screen.

2.3 MAINTENANCE PROCEDURES

Inevitably, errors are introduced into the system. Transcription errors, transposition errors and errors of omission often escape detection in computerized data-validation routines if they do not violate any range or table restrictions. As a result, maintenance procedures are required. Two such procedures or routines exist in SEDS.

2.3.1 Stream master maintenance routine

This routine allows privileged users the ability to modify existing stream information (e.g., rabcode or gazetted name) or to add streams that have been inspected for the first time. If the rabcode of a stream to be added is unknown, an arbitrary code beginning with the two digits 29 is used. The leading 2 digits 29 are used as they represent the Peace River watershed, where no salmon spawning streams are located. This convention prevents a legitimate rabcode being assigned to a stream whose rabcode is unknown and allows escapements for streams whose rabcodes are unknown to be entered into the system.

2.3.2 Escapement data maintenance routine

This routine allows privileged users the ability to modify Annual Report information (e.g., enumeration methodologies or escapement estimates) using the BC16 data-entry screen (Figure 2.2).

CHAPTER 3 THE STREAM MASTER SYSTEM

The stream master is a computer file of all the streams in British Columbia that have been reported by Departmental field staff as having salmon spawn since 1953. The current number of salmon streams in the stream master is 1975.

3.1 ORIGIN OF THE WATERSHED-CODING SYSTEM

The salmon escapement system hinges on the ability to uniquely identify a stream. The system adopted for identifying watersheds was developed by the Aquatics Unit of the Resource Analysis Branch, Ministry of the Environment, the Province of B.C.. Following the acronym (RAB) for this branch, the resulting code is called a rabcode. This system uniquely classifies catchment areas and river channels.

Stream channels and their tributaries are naturally organized, directional and hierarchical. The watershed-coding system not only provides unique stream identification but also reflects these attributes as well.

The system evolved by first dividing British Columbia into 9 principle drainages and one arbitrarily assigned coastal unit (Table 3). These watersheds were then subdivided in greater and greater detail in a repetitive 2 stage process:

Stage 1: Major catchments were delineated.

Stage 2: These watersheds had their channels designated and their tributary watersheds delineated, numbered sequentially going upstream on the mainstem.

Figure 3.1 shows the geographic boundaries of the the salmon-producing watersheds.

TABLE 3. Major catchment areas of salmon spawning streams

00 Fraser River
- 01 Lillooet-Harrison Rivers
- 02 Thompson River (from mouth to confluence of North and South Thompson)
- 03 South Thompson River
- 04 North Thompson River
- 05 Chilcotin River
- 06 Qesnel River
- 07 West Road River
- 08 Nechako River
- 09 Stuart River

30 Columbia River
- 31 Okanagan River

40 Skeena River
- 41 Exchamsiks River
- 42 Lakelse River
- 43 Kitsumkalum River
- 44 Zymoetz River
- 45 Kitseguelca River
- 46 Bulkley River
- 47 Kispiox River
- 48 Babine River
- 49 Sustut River

70 Nass River
- 71 Ishkheeneckh River
- 72 Kinskuch River
- 73 Cranberry River
- 74 White River
- 75 Meziadin River-Strohn Creek
- 76 Bell-Irving River
- 77 Taylor River

90 South Coast Rivers (South of Cape Caution)
- 91 Central Coast Rivers (Cape Caution North to Lambert Point at mouth of Skeena River)
- 92 Vancouver Island East
- 93 Vancouver Island West
- 94 Graham Island
- 95 Moresby Island
- 96 North Coast Rivers (north of Gust Point at mouth of Skeena River)
- 97 Central Coast Islands

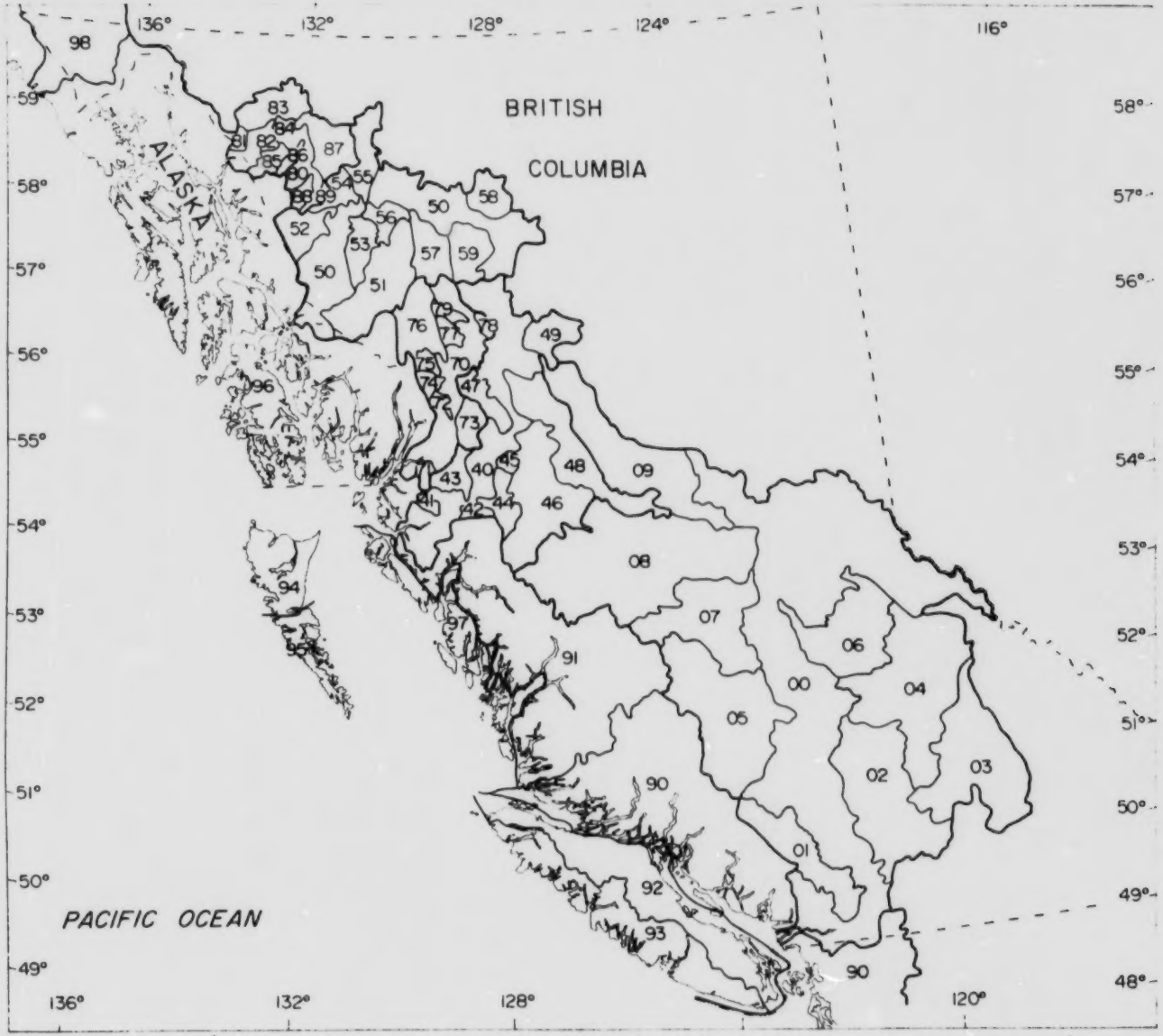


Figure 3.1. Major watersheds and code numbers.

3.2 INTERPRETATION OF THE WATERSHED-CODING SYSTEM

Each watershed-code comprises 21 digits in 7 levels (i.e. xx-xxxx-xxx-xxx-xxx-xxx-xxx). Each level reflects the hierarchical organization of watersheds within watersheds. The first level, 2 digits, delineates watersheds within major catchment areas (see Table 3). The second level, 4 digits, indicates main river channels. Levels 3 thru 7, 3 digits each, denote tributaries and the level attained depends on the hierarchical position of a tributary in relation to the main stream channel which it eventually flows into.

TABLE 4. Example of the hierarchical watershed coding system.

00-____-___-___-___-___-___	Fraser River
00-0600-___-___-___-___-___	Sumas River
00-0600-020-___-___-___-___	Chilliwack River
00-0600-050-___-___-___-___	Lonzo Creek
00-0600-020-010-___-___-___	Street Creek
00-0600-020-020-___-___-___	Sweltzer River
00-0600-020-010-010-___-___	Hopedale Slough

Table 4 in conjunction with Figure 3.2 illustrates the hierarchical nature of the coding system. Figure 3.2 shows Sumas River (RAB No. 00-0600) which flows into Fraser River (RAB No. 00). Chilliwack River (RAB No. 00-0600-020) flows into Sumas River and is further downstream than Lonzo Creek (RAB No. 00-0600-050) which also flows into Sumas River. Sweltzer River (RAB No. 00-0600-020-020) flows into Chilliwack River between Street Creek (RAB No. 00-0600-020-010) and Ryder Creek (RAB No. 00-0600-020-050). Hopedale Slough (RAB No. 00-0600-020-010-010) flows into Street Creek.

To accomodate streams that are subdivided into sections for enumeration purposes, the SEDS system uses modified rabcodes. The seventh level of the rabcode is modified to identify these sections. For example, Club Creek has rabcode 47-1800-030. Departmental field staff report Club Creek escapement estimates on two forms, Club Creek Upper and Club Creek Lower. In order to accomodate both estimates, the former is assigned rabcode 47-1800-030-000-000-000-000-991 and the latter is assigned rabcode 47-1800-030-000-000-000-000-992. (Note: For brevity, the term **rabcode** will be used from this point on to denote **watershed-code**).

For a report depicting the geographical locations and rabcodes of salmon spawning streams of British Columbia, see (Serbic et al. 1985).

RAB Number Hierarchy

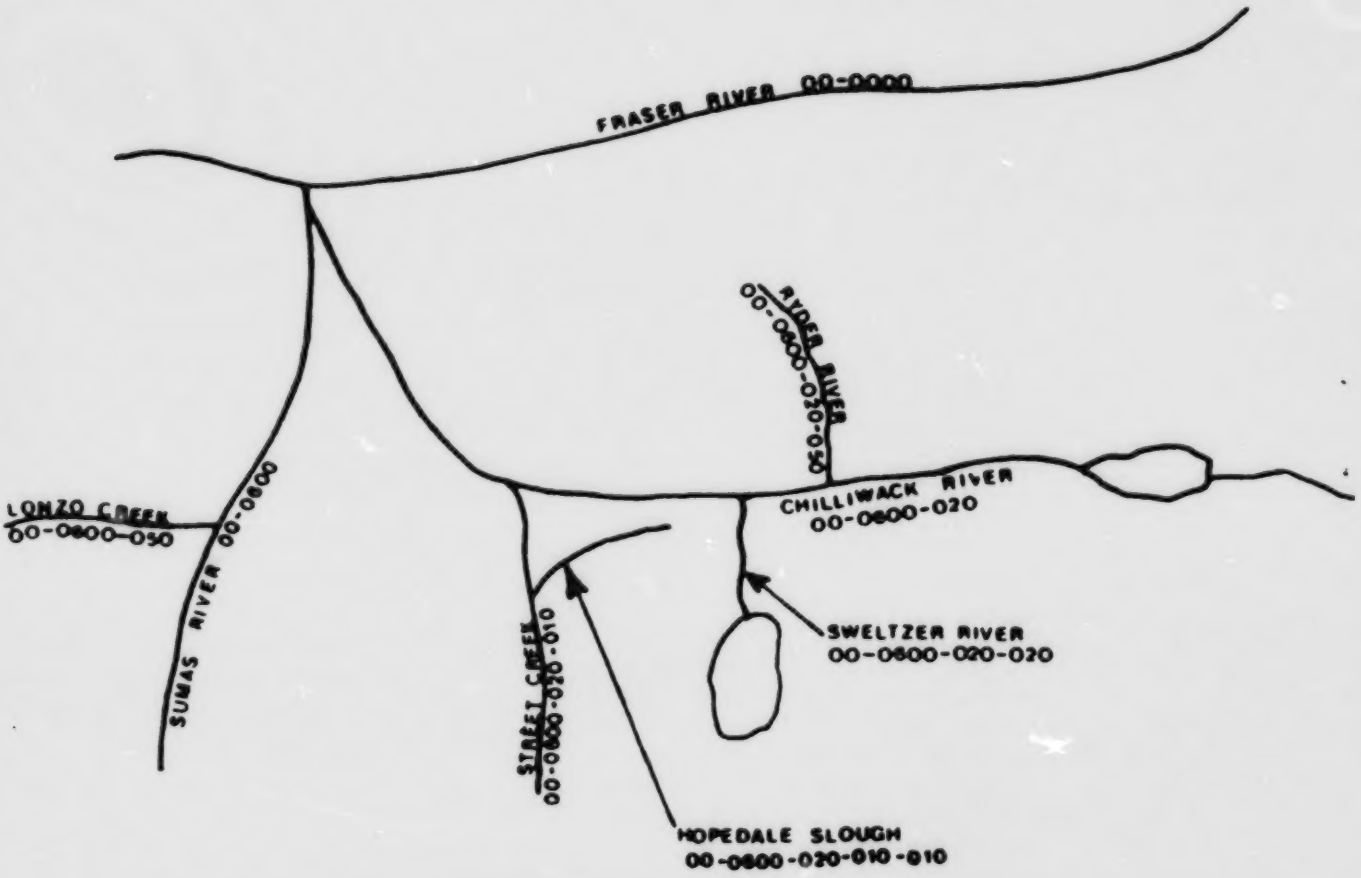


Figure 3.2. Pictorial example of the watershed coding hierarchy.

CHAPTER 4 REPORT GENERATION MODULE

Optimally, a report generator allows a report format to be specified, restrictions applied and a report to be produced in a minumum amount of time and with predictable results. To achieve these goals, three features have been incorporated:

1) **Peruse Mode** This eliminates the uncertainty of report format by allowing the user to scan the available report formats.

2) **Design Screen** This allows flexible, rapid selection of report format.

3) **Restrictions Screen** This allows rapid application of report restrictions.

4.1 PERUSE MODE

To eliminate the uncertainty of the type of report being generated, a peruse feature has been introduced. To enter this mode, the operator types <CTL-P> at any juncture of the report design screen.

Once in this mode, the operator can scan the types of reports that are available by hitting the <RETURN> key. When the desired report is on the screen, typing <CTL-P> establishes that format for the report about to be generated. The appropriate restrictions screen is then displayed. (i.e., Typing <CTL-P> in peruse mode bypasses the report design screen). Typing <CTL-Z> at any juncture of peruse mode returns the operator to the report design screen.

4.2 REPORT DESIGN MODULE

This module allows users to design their own report by allowing them to specify the row, column, and page variables. For example, the selections in Figure 4.1 produce a Rabcode report, with rabcodes as rows, species as columns and years as page break. Once rabcode, stat. area or user-defined group has been selected, the remaining selections are confined to species and year. This is due to the incompatibility of rabcode, stat. area, and user-defined group as report variables. Once the selections are confined to species and year, selection of one defaults the other. For example, in Figure 4.1, selection of rabcode as row, confines the remaining report variable selections to species and year. Selecting species as column, defaults year to page. (Note : Since year defaults to page, access to Page Variable selection is bypassed).

REPORT VARIABLES	ROW	COLUMN	PAGE
RABCODE	X		
SPECIES		X	
YEAR			
STAT. AREA			
USER GROUP			

<Return> to move,X to select,<Ctl-P> to peruse,<Ctl-Z> to exit

Figure 4.1. Report Design Screen example.

4.3 REPORT RESTRICTIONS SCREEN

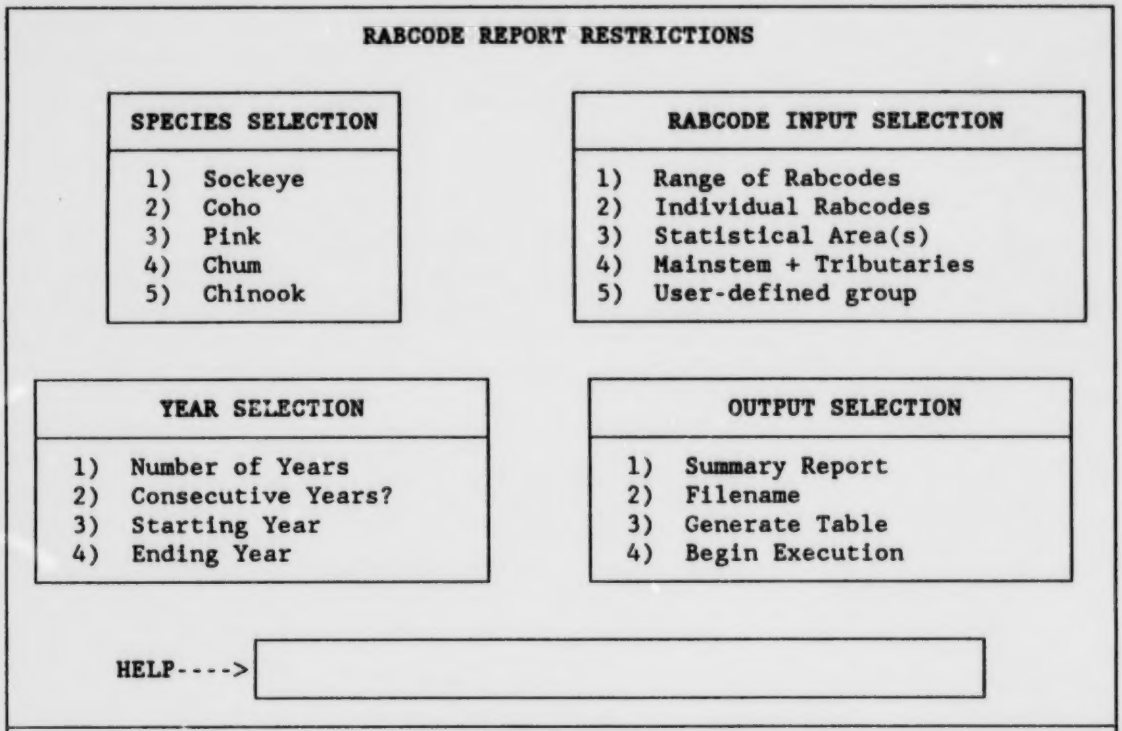
Once the format of the report has been selected, report restrictions need to be applied (e.g., restrictions on rabcodes, species and years). These are applied using the restriction screens. There are three restriction screens, one for each of rabcode, statistical area and user-defined group. The responses in Figure 4.1 invoke the rabcode report restrictions screen (Figure 4.2).

4.3.1 Rabcode report restrictions screen

The rabcode report restrictions screen consists of 4 sections namely:

1) a species restriction section;
2) a rabcode restriction section;
3) a year restriction section;
4) an output restriction section.

A help section at the bottom of the screen provides the necessary operator assistance.



Following is an explanation of the prompts that appear in the various selection windows, with a brief description of valid operator responses.

1) **Species Selection** From 1 to 5 species can be selected. Hitting <RETURN> moves the cursor between species. Typing an X next to a species name selects that species, hitting the space bar unselects it. Typing <CTL-Z> terminates species selection.

2) **Rabcode Input Selection** Five possible rabcode-input methods are available. The user has the choice of either selecting the streams one at a time using rabcode or stream name as the selection criteria (Figure 6.6) or specifying a stream. Four multiple-stream input methods are available:

a) **Rabcode-Range (Figure 6.3)** All streams within the specified range are included in the report.
b) **Statistical Area(s) (Figure 6.5)** All streams in the statistical area(s) selected are included in the report.
c) **Mainstem and Tributaries (Figure 6.4)** The specified mainstem and all of its tributaries are included in the report.
d) **User-defined Group (Figure 6.2)** All streams in the user-defined group are included in the report.

Hitting <RETURN> moves the cursor between input methods, typing an X selects a method. Once an X has been typed, the appropriate rabcode selection screen is displayed and the rabcodes are selected. The cursor then moves to the 'Number of years' prompt.

3) Number of years The number of years of data to be included in the report. The maximum number is equal to the current year -1952.

4) Consecutive years Whether the specified number of years are to be consecutive or not. If non-consecutive, the years are entered in the non-consecutive years portion of the restrictions screen

5-6) Starting Year/Ending Year If the years are consecutive, the starting year determines the ending year. Otherwise, both are determined from the non-consecutive years selected.

7) Summary Report Specifying 'Y' to this prompt produces a report of grand totals. Otherwise a detailed report is produced.

8) Filename The name of the computer file to which the output will be written. The length of the filename is restricted to 8 characters to conform to the maximum length permissible in MSDOS. This eliminates the potential need to rename files generated by the SEDS system for use in PC environments. (Note: The filename cannot have an extension. The extension .DAT is applied)

9) Generate Table Responding 'Y' to this prompt produces an NROW * NCOL table, where NROW is the number of rows and NCOL is the number of columns as determined by the restrictions screen responses. The table is formatted Harvard Graphics' compatible to facilitate ease of importing and plotting. The table is given the same filename as in (8) with the extension .TAB. For an example table, see Figure 4.3.

"SPECIES:COHO"						
"		85	86	87	88	89"
"47-0000	"	750	1500	1000	100	1600
"49-0000	"	0	-2	200	0	-1
"70-0000	"	-2	-2	-2	-2	-2
"71-0000	"	2000	3000	3000	-2	1000
"00-0000	"	0	-2	0	0	0
"SPECIES:PINK"						
"		85	86	87	88	89"
"47-0000	"	200000	170000	500000	10000	330000
"49-0000	"	0	-2	0	0	0
"70-0000	"	-2	-2	-2	-2	-2
"71-0000	"	50000	10000	30000	5000	60000
"00-0000	"	0	-2	0	0	0

Figure 4.3. Example of a generated table.

10) **Begin Execution** Hitting <RETURN> commences report generation. To abort the report, type either <CTL-E> or <CTL-Z>. <CTL-E> clears all restrictions and returns the cursor to the first prompt. <CTL-Z> clears all restrictions and the selected report format and returns the user to the report design screen.

For an example rabcode report restrictions screen session, see Figure 4.4.

RABCODE REPORT RESTRICTIONS

SPECIES SELECTION	
1) Sockeye	X
2) Coho	X
3) Pink	
4) Chum	
5) Chinook	

RABCODE INPUT SELECTION	
1) Range of Rabcodes	
2) Individual Rabcodes	
3) Statistical Area(s)	X
4) Mainstem + Tributaries	
5) User-defined group	

YEAR SELECTION	
1) Number of Years	10
2) Consecutive Years?	Y
3) Starting Year	79
4) Ending Year	88

OUTPUT SELECTION	
1) Summary Report	Y
2) Filename	1819
3) Generate Table	N
4) Begin Execution	Y

HELP---->

Figure 4.4. Rabcode report restrictions example.

The report (Figure 4.5) that would be produced using the responses in Figures 4.1 and 4.4 would have the following restrictions:

1) **Report Format** Rabcodes would form the rows, species the columns, and page break would be by year.

2) **Species** Only the species sockeye and coho would be reported.

3) **Rabcodes** Only the rabcodes in the input stream cluster. For this example, statistical area was selected as the rabcode-input method. If, for example, areas 18 and 19 were chosen as the statistical areas then only the streams in areas 18 and 19 would be included in the report.

4) **Years** The years 1979 thru 1988.

5) Report Type A summary report by rabcode, with no table generated. The output filename would be 1819.dat.

STAT AREA RABCODE REPORT BY YEAR
STAT. AREAS:18 19
(YEARS:1979-1988)

RABCODE	STREAM NAME	SUBD.	SOCKEYE	COHO
92-4750-200	FULFORD CREEK	18	0	895
92-4800	COWICHAN RIVER	18	0	210000
92-4800-020	KOKSILAH RIVER	18	0	24000
92-5000	SHAWNIGAN CREEK	19	0	762
92-5200	GOLDSTREAM RIVER	19	0	2142
92-5400	TOD CREEK	19	0	7
92-5500	HAGAN CREEK	19	0	0
92-5600	REAY CREEK	19	0	15
92-5700	SANDHILL CREEK	19	0	0
92-6000	COLQUITZ RIVER	19	0	325
92-6100	CRAIGFLOWER CREEK	19	0	1007
	GRAND TOTALS (11 STREAMS):		0	239153

Figure 4.5. Rabcode report example.

4.3.2 Statistical area report restrictions screen

The statistical area restrictions screen mimics the rabcode restrictions screen with the exception of a statistical area selection window replacing the rabcode-input selection window. Typing <CTL-P> selects an area, hitting <RETURN> moves the cursor to the next statistical area. Typing <CTL-Z> terminates area selection. Once <CTL-Z> has been typed, the statistical area window is cleared and the areas that have been selected are re-displayed. For an example, see Figure 4.6.

STATISTICAL AREA REPORT
RESTRICTIONS

SPECIES SELECTION	
1) Sockeye	X
2) Coho	X
3) Pink	
4) Chum	X
5) Chinook	

STATISTICAL AREA SELECTION
28A 28B

YEAR SELECTION	
1) Number of Years	10
2) Consecutive Years?	Y
3) Starting Year	79
4) Ending Year	88

OUTPUT SELECTION	
1) Summary Report	Y
2) Filename	SQUAMISH
3) Generate Table	N
4) Begin Execution	Y

HELP---->

Figure 4.6. Statistical area report restrictions example.

The output from the above restrictions is Figure 4.7.

GRAND TOTALS
STAT. AREAS:28A 28B

YEAR	SOCKEYE	COHO	CHUM
1979	83575	21346	33688
1980	116956	31915	243650
1981	70537	32472	146377
1982	131212	32279	175390
1983	57985	32812	120300
1984	72283	65122	177351
1985	43575	59544	407873
1986	358650	47800	280053
1987	179334	18631	75264
1988	229310	10655	98570
TOTALS	1343417	352576	1758516

Figure 4.7. Statistical area report example.

4.3.3 User-defined group report restrictions screen

The user-defined group restrictions screen differs from the statistical area restrictions screen in that a group selection window replaces a statistical area selection window. The operator types in the 1 to 20 character group name, minus any extension, and hits <Return>. Typing <Ctl-Z> terminates group selection. A maximum of 5 groups can be selected for any given report. (Note: A stream group must already have been created using the Stream Group Creation and Maintenance Module (see Chapter 6) in order for it to be selected). For example, suppose years have been selected as rows, species as columns, and user-defined group as page break in the report design phase. With the user-defined group report restrictions in Figure 4.8 applied, the resulting output is Figure 4.9.

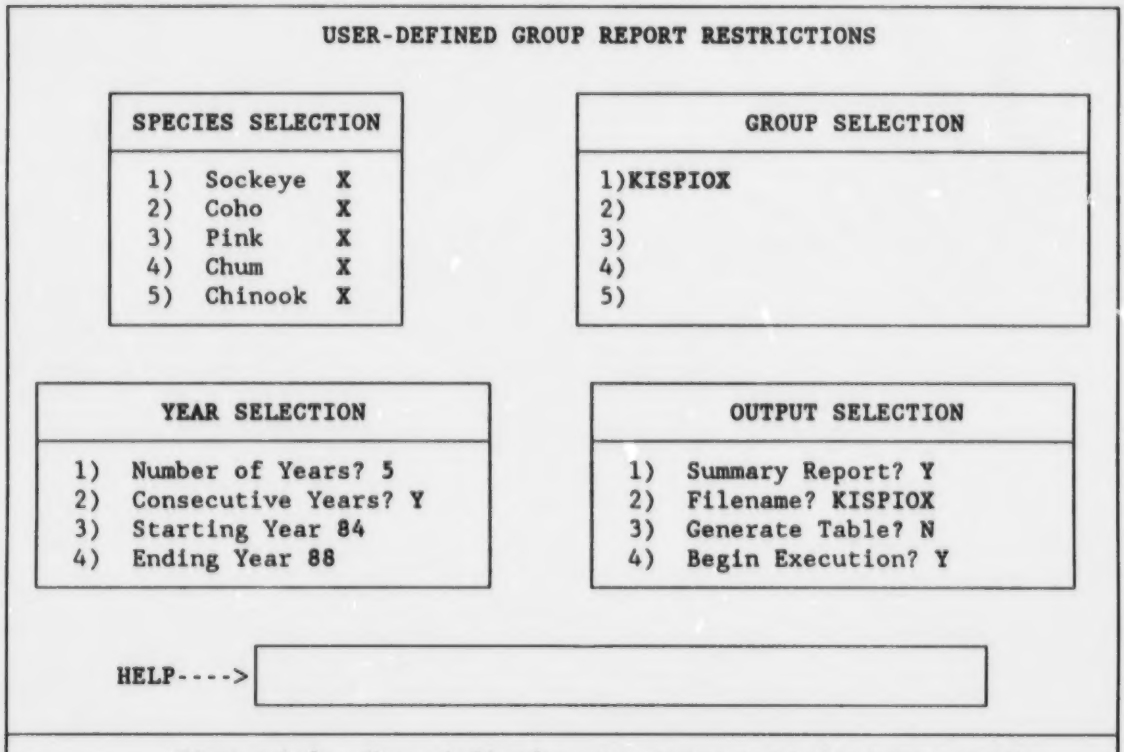


Figure 4.8. User-defined group report restrictions example.

BC16 SALMON ESCAPEMENT REPORT
GROUP:KISPIOX

	1984	1985	1986	1987	1988	TOTAL	AVERAGE
SOCKEYE	6000	7700	6250	9000	9000	37950	7590
COHO	3810	1800	4625	4625	335	15195	3039
PINK	11735	204125	171850	504550	10450	902710	180542
CHUM	1190	310	350	500	500	2850	570
CHINOOK	1362	2600	5400	4320	5625	19307	3861

Figure 4.9. User-defined group report example.

Once the report is complete, hitting <RETURN> redisplays the restrictions screen with all previous responses as defaults. The user can then easily rerun a report of the same format by <RETURN>ing over those responses that are the same and modifying those that are different. The restrictions screen supports the following features:

(1) To abort any restrictions screen and return to the report design screen, type <CTL-Z>.

(2) To clear all restrictions and return to the first prompt in the current screen, type <CTL-E>.

(3) To return to a previous field within a restrictions screen, type <CTL-H>.

CHAPTER 5 ESCAPEMENT QUERY MODULE

The Escapment Query module allows the user to query the Salmon Escapement Database and retrieve stream or escapement information based on other information that is known. Eight query screens exist, accessible thru the Main query screen (Figure 5.1). (Note: Typing <CTL-P> during a Query session sends the information currently displayed to a file Query.dat in the users directory).

RETRIEVE	GIVEN
Stream Name	Rabcode _
Rabcode(s)	Stream Name _
Escapements	Rabcode + Year _
Flows Into	Stream Name _
Tributaries	Stream Name _
Stream Names + Rabcodes	Subdistrict _
All Escapements	Rabcode _
Stream History	Rabcode _

HELP--> Type X to Select, <Return> to Move, <CTL-Z> to Exit

Figure 5.1. Main query screen.

5.1 STREAM NAME SCREEN

The Stream name query screen is used to determine the gazetted name, local names and subdistrict given the rabcode. For an example, see Figure 5.2.

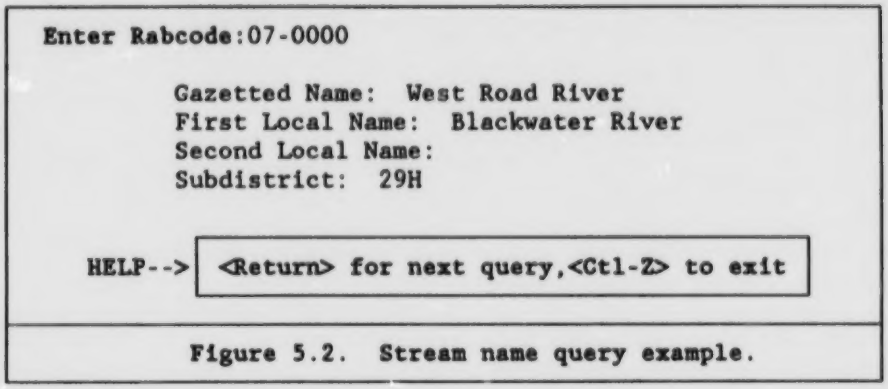


Figure 5.2. Stream name query example.

5.2 RABCODES SCREEN

The Rabcodes query screen is used to determine the rabcodes, alternate creek names and subdistricts of all creeks in the stream master file having the input stream name as a gazetted or local name. For an example, see Figure 5.3.

Enter Stream Name:Salmon River

Rabcode	Alternate Name	Subdistrict
00-0300		29B
00-5000		29I
03-5200		29K
92-1700		13
00-1200		29F
40-2500	Segunia River	4C
97-8200-060	Kubas River	05

HELP--> <Return> for next query,<Ctl-Z> to exit

Figure 5.3. Rabcodes query example.

5.3 RUN TIMING AND ESCAPEMENTS SCREEN

Supplied rabcode and year, the Run-timing and escapements screen displays escapement information as reported by Departmental field staff for that stream and year. Information such as the first and last inspection dates, the date(s) of species arrival at the stream mouth, the start, peak and end of spawning dates, the number of stream visitations on which the species was observed, the methods of escapement enumeration, the estimated annual escapements, the reliabilities of the estimates, and the optimum escapements is displayed. For an example, see Figure 5.4.

Enter Rabcode:91-8000 Enter year:88

Gazetted Name:Kiltuish River District: 07

Local Name: Subdistrict: 06

Inspection Dates: First Inspected: JUL 24 Last Inspected: SEP 16

Species	Arrival In Stream	Duration of spawning Start	Peak	End	# OBS	Methods	Reliab.	Est. Esc.	Opt. Esc.
Sockeye: Run 1									
Run 2									
Coho: Run 1	SEP 15	SEP 15	OCT 15	NOV		1,3	2	200	3000
Run 2									
Pink: Run 1	AUG 5	AUG 25	SEP 5	SEP 25		1,3	4	9,500	2000
Run 2									
Chum: Run 1	JUL 25	AUG 5	AUG 15	SEP 15		1,3	4	7,000	3000
Run 2									
Chinook: Run 1	JUN	JUL 15	JUL 25	AUG 15		1,3	1	-1	400
Run 2									

Figure 5.4. Run-timing and escapements query example.

5.4 FLOWS INTO SCREEN

Supplied a stream name and a subdistrict, the Flows Into screen displays the rabcode, gazetted name, local name, and subdistrict of the recieving waters. For an example, see Figure 5.5. (Note: A message 'RECEIVING WATERS ARE UNAVAILABLE' will be displayed if the receiving waters do not have an Annual Report on file).

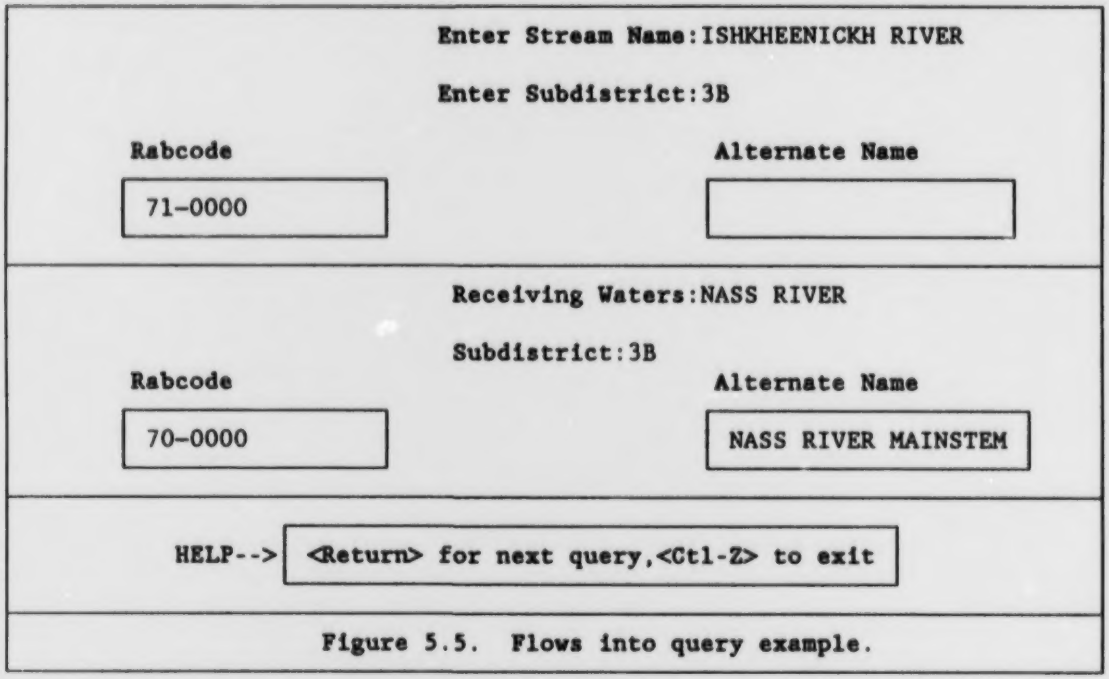


Figure 5.5. Flows into query example.

5.5 STREAM TRIBUTARIES SCREEN

Supplied a stream name and a subdistrict, the Stream Tributaries screen displays the rabcodes and stream names of all salmon spawning streams that are tributary. For an example, see Figure 5.6.

Enter Stream Name:Nitinat River Enter Subdistrict:22

Watershed Code:93-1500

Rabcode	Tributary Name
93-1500-130	DOOBAH CREEK
93-1500-150	MARCHAND CREEK
93-1500-200	HOBITON LAKE
93-1500-300	CAYCUSE RIVER
93-1500-350	CAMPUS CREEK

HELP-> End of tributaries list.<Return> for next query,<Ctl-Z> to exit

Figure 5.6. Stream tributaries query example.

5.6 SUBDISTRICT STREAM SURVEY SCREEN

Supplied a subdistrict, the Subdistrict Stream Survey screen displays the rabcodes, gazetted names, and local names of all salmon spawning streams in that subdistrict. For an example, see Figure 5.7.

Enter subdistrict:22

Rabcode	Gazetted Name	Local Name
29-3910		KLAKTUS CREEK
29-6111		STOKEHOUSE CREEK
93-1500	NITINAT RIVER	
93-1500-130	DOOBAH CREEK	
93-1500-150	MARCHAND CREEK	
93-1500-200	HOBITON LAKE	
93-1500-300	CATCUSE RIVER	
93-1500-350	CAMPUS CREEK	

HELP-> End of stream list.<Return> for next query,<Ctl-Z> to exit

Figure 5.7. Subdistrict stream survey example.

5.7 ALL ESCAPEMENTS SCREEN

Supplied a rabcode, the All escapements screen displays the stream name, subdistrict, and all escapements. For an example see Figure 5.8.

Enter rabcode:47-0000

Stream Name:KISPIOX RIVER
Subdistrict:4C

Year	Sockeye	Coho	Pink	Chum	Chinook
1953	0	-2	-2	-2	-2
1954	0	7500	75000	15000	3500
1955	0	7500	750000	1500	7500
1956	0	7500	75000	1500	3500
1957	0	15000	500000	3500	15000
1958	0	35000	70000	1500	7500
1959	0	1500	750000	1500	7500
1960	0	0	60000	0	0
1961	550	3500	300000	450	-2
1962	0	400	67000	25	25
1963	-2	-2	32500	0	-1
1964	0	750	7500	200	75
1965	0	750	35000	400	1500
1966	0	75	1500	750	400
1967	0	-2	74000	-2	-2
1968	0	1500	3500	400	400
1969	0	750	180000	400	400
1970	0	750	7500	400	400
1971	0	750	400000	400	400
1972	0	750	15000	3500	400
1973	0	750	398000	1500	3500
1974	0	750	5000	1500	3000
1975	0	750	200000	750	3500
1976	0	750	10000	750	750
1977	0	750	200000	750	750
1978	0	1500	10000	200	400
1979	0	750	90000	25	400
1980	0	600	5000	75	300
1981	0	500	130000	25	725
1982	-3	-3	-3	-3	-3
1983	0	2000	180000	0	500
1984	0	2000	10000	800	1100
1985	-2	750	200000	275	1200
1986	0	1500	170000	300	4000
1987	0	1000	500000	500	4000
1988	0	100	10000	500	5000
1989	0	1600	330000	500	3500
TOTALS:	550	100025	5851500	39875	81125

Figure 5.8. All escapements example.

Interpretation of negative escapement codes should be as follows:

-1 = Stream inspected, no fish observed

-2 = Stream not inspected or not inspected for this species or species present but no estimate made

-3 = No record for this stream in this year

5.8 STREAM HISTORY SCREEN

Supplied a rabcode, the Stream history screen displays the escapement history of a stream. For an example, see Figure 5.9.

ENTER RABCODE: 00-0100 SUBDISTRICT: 29C
DISTRICT: 2
GAZETTED NAME: BRUNETTE RIVER DIVISION: FRASER
LOCAL NAME: STILL CREEK
STATUS: ACTIVE
FIRST INSPECTED: 1953 LAST INSPECTED: 1987

YEARS NOT INSPECTED: 68 69 70 71 72 73 74 75 76 77 78 79 80 81 86

	Average Escapements (1978-1987)	Highest Recorded Esc.	1987 Esc.	% of Subd. Totals	Rank in Subd (19)	Rank in BC (1675)
Sockeye						
Coho	150	3500 '54	200	5.77	6	292
Pink						
Chum	18	50 '87	50	0.12	12	603
Chinook						

1987 Run timing:

	Sockeye	Coho	Pink	Chum	Chinook
Arrival					Nov 1
Start	Nov 15	Nov 30	Jan 1		
Peak			Oct 15	Oct 31	Nov 1
End	Nov 30				

Figure 5.9. Stream history query example.

The Stream history screen provides the following information:

1) the gazetted name, local names, subdistrict, district, and management division (see Figure 5.10 for management divisions);

2) the stream status. A stream is deemed active if an escapement greater than 0 has been reported in the last 3 years. Otherwise, it is considered inactive;

3) the first year that the stream was inspected and a BC16 filed;

4) the most recent year for which a BC16 has been filed;

5) a list of years for which no BC16 is on file;

6) the most recent 10 year averages for the species that spawn in the stream;

7) the highest recorded escapements and the years in which they occurred;

8) the escapements for the last year the stream was inspected;

9) the percentages of the subdistrict totals that the escapements in (8) represented;

10) the ranks within the subdistrict that the escapements in (8) represented. (In brackets, the total number of streams in the subdistrict that reported an escapement greater than 0 in the year the stream was last inspected);

11) the ranks within BC that the escapements in (8) represented. (In brackets, the total number of streams in BC that reported an escapement greater than 0 in the year the stream was last inspected);

12) the run-timing for the year the stream was last inspected. (i.e., The arrival dates of each species at the mouth of the stream and the start, peak and end of spawning dates for each species).

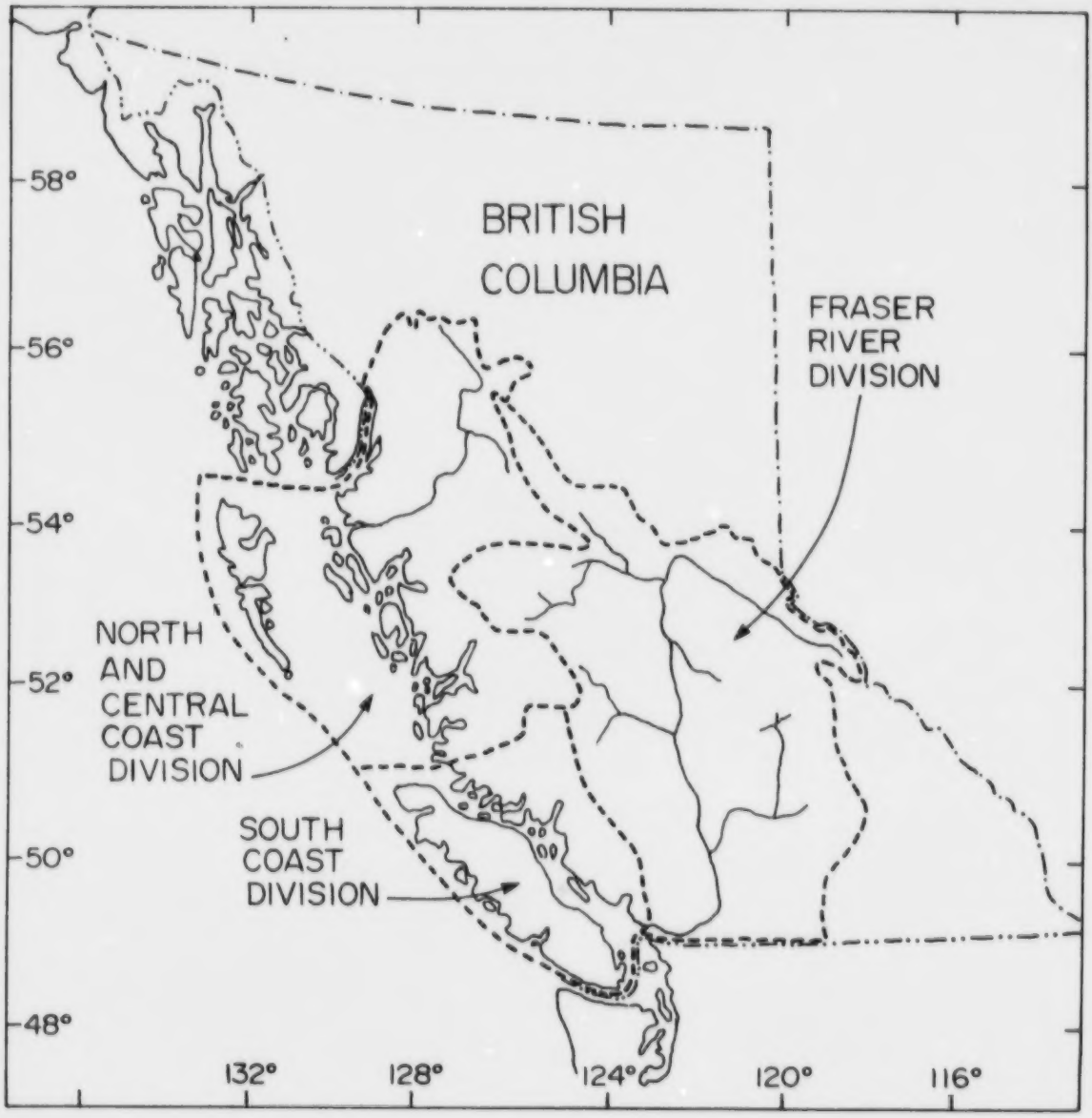


Figure 5.10. Management Divisions.

CHAPTER 6 STREAM GROUP CREATION AND MAINTENANCE MODULE

Users often report on a specific grouping of streams on a consistent basis. Rather than duplicating the tedious effort of stream selection each time a report is generated, this module provides the capability of creating a file that resides in the user's directory containing all the desired streams. Once established, reporting on this grouping of streams can be achieved by simply specifying the filename in the report restrictions phase.

6.1 STREAM GROUP MAINTENANCE

Suppose a user consistently generates reports on the same statistical areas, river systems, and individual streams. In particular, suppose the streams of interest include all the streams on the Queen Charlotte Islands plus the Nass and Skeena River systems, as well as some isolated streams. The total number of streams exceeds 300. The amount of time required to specify each stream for the report is substantial. Moreover, each time the report is required, the streams need to be reselected since no facility exists for saving stream selections. The need for a rapid selection/storage/retrieval mechanism of large aggregates of streams is clearly required. Hence, the Stream Group Maintenance Module.

The Stream Group Maintenance Module (Figure 6.1) provides the user with the ability to <C>reate, <M>odify, <D>elete, or <E>xamine a stream group. A stream group consists of subgroups or stream clusters of the following four types: Ranges of Rabcodes, River Systems, Statistical Areas, and Aggregates of Individual Streams.

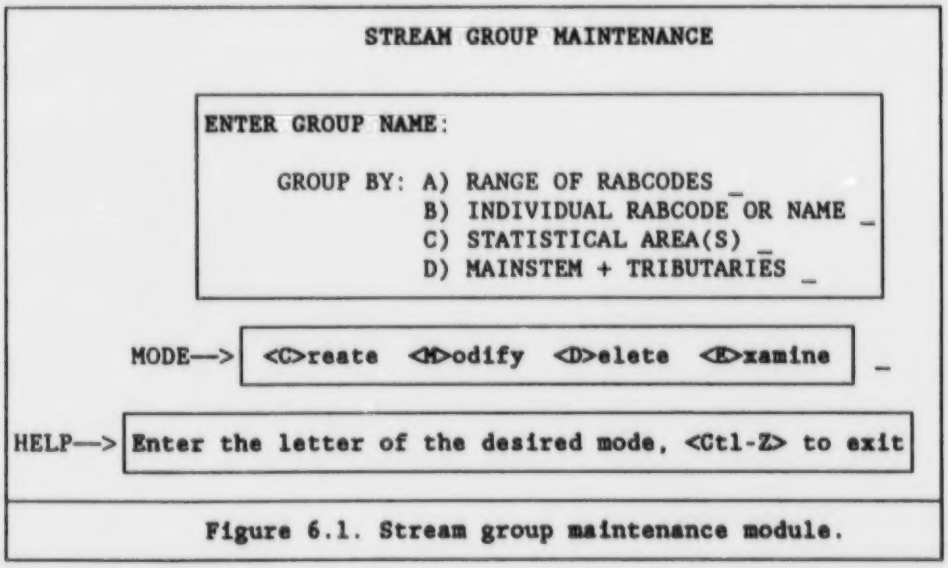


Figure 6.1. Stream group maintenance module.

6.2 CREATING GROUPS

To create a stream group, the following procedure is followed:

1) enter a C at the MODE prompt;
2) enter a 1-20 character group name at the group name prompt and hit <RETURN>;
3) select a grouping method by hitting <RETURN> until the cursor is next to the desired stream aggregation method. Then, type an X to select this method. For an example, see Figure 6.2.

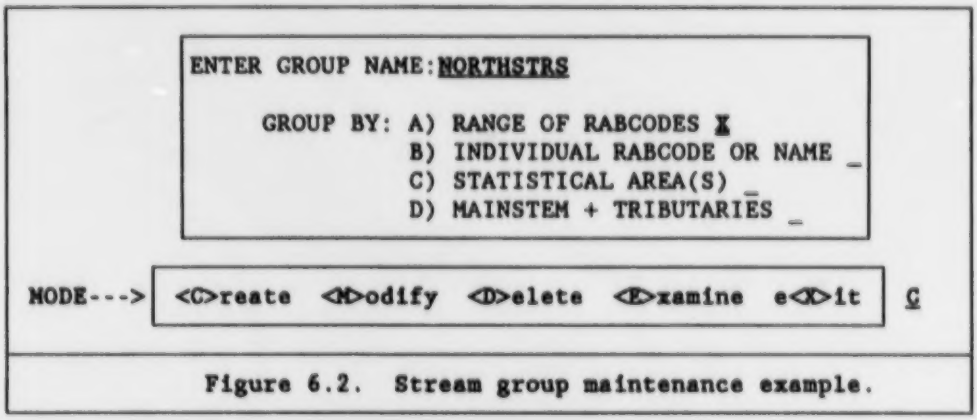

ENTER GROUP NAME:NORTHSTRS
GROUP BY: A) RANGE OF RABCODES X
B) INDIVIDUAL RABCODE OR NAME _
C) STATISTICAL AREA(S) _
D) MAINSTEM + TRIBUTARIES _
MODE---> <C>reate <M>odify <D>elete <E>xamine e<X>it C

Figure 6.2. Stream group maintenance example.

The responses in Figure 6.2 result in a file NORTHSTRS.GRP being created in the user's directory and the Rabcode-Range Group Creation screen, (Figure 6.3), being displayed. (Note:Group filenames must be unique. One cannot create a NORTHSTRS.GRP if one already exists. The existing one must be deleted before another one can be created).

6.2.1 Group Type 1: Rabcode-Range

This group consists of all rabcodes that fall inclusively within the user-specified range and is created using the Rabcode-Range Group Creation screen. For an example, see Figure 6.3.

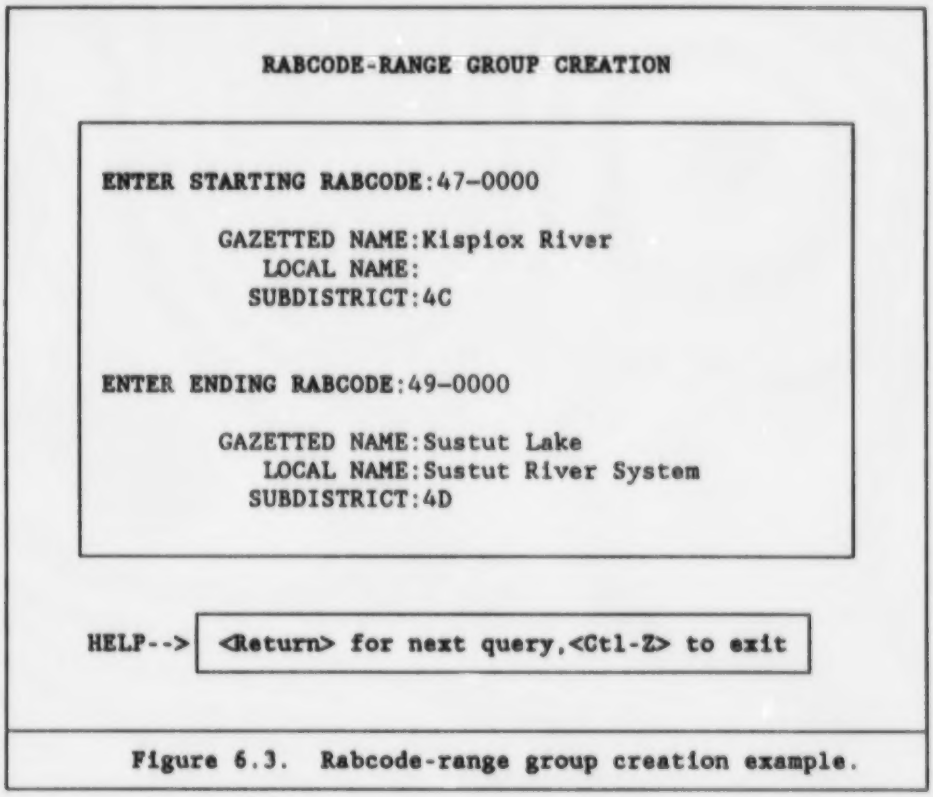


Figure 6.3. Rabcode-range group creation example.

A report on this group consists of all streams whose rabcodes lie between 47-0000 and 49-0000 or equivalently all streams that are tributary to one of the following:

1) 47-0000 Kispiox River
2) 48-0000 Babine River
3) 49-0000 Sustut Lake

The resulting record in the NORTHSTRS.GRP file is R1 470000:490000*.

6.2.2 Group Type 2: Mainstem

This group consists of all rabcodes that have the mainstem rabcode as a prefix and is created using the Mainstem Group Creation screen. For an example, see Figure 6.4.

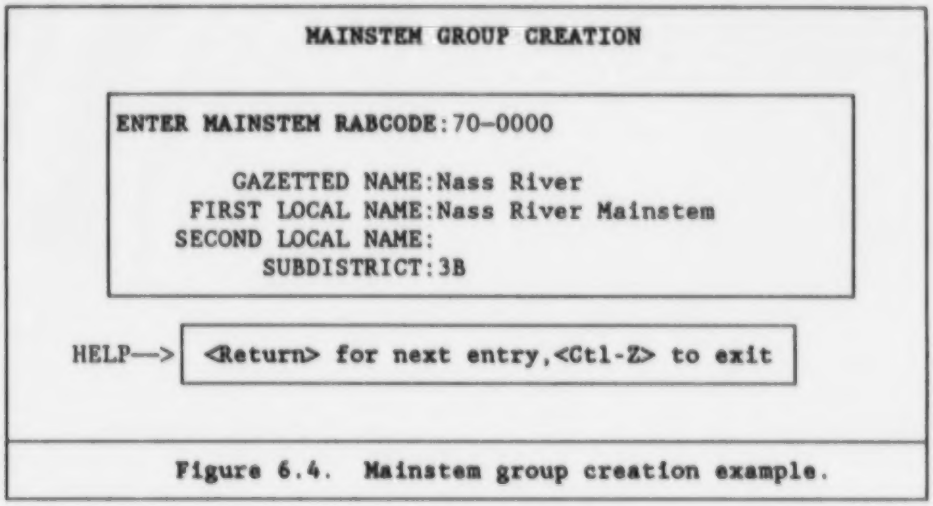


Figure 6.4. Mainstem group creation example.

A report on the above group consists of all streams that are tributary to 70-0000 or equivalently, the Nass River System. Since any rabcode consisting of only two levels that has the form XX-0000 delineates a major catchment area (Table 3), the above group consists of all streams that have '7' as the leading rabcode digit, the second digit '0' being extraneous. This group thus consists of all salmon streams tributary to any one of the following:

1) 70-0000 Nass River
2) 71-0000 Ishkheenickh River
3) 72-0000 Kinskuch River
4) 73-0000 Cranberry River
5) 74-0000 White River
6) 75-0000 Meziadin River - Shohn Creek
7) 76-0000 Bell-Irving River
8) 77-0000 Taylor River

The resulting record in the NORTHSTRS.GRP file is R2 700000*

6.2.3 Group Type 3: Statistical Area(s)

This group consists of all rabcodes that fall within the statistical areas selected and is created using the Statistical Area Group Creation Screen. For an example, see Figure 6.5.

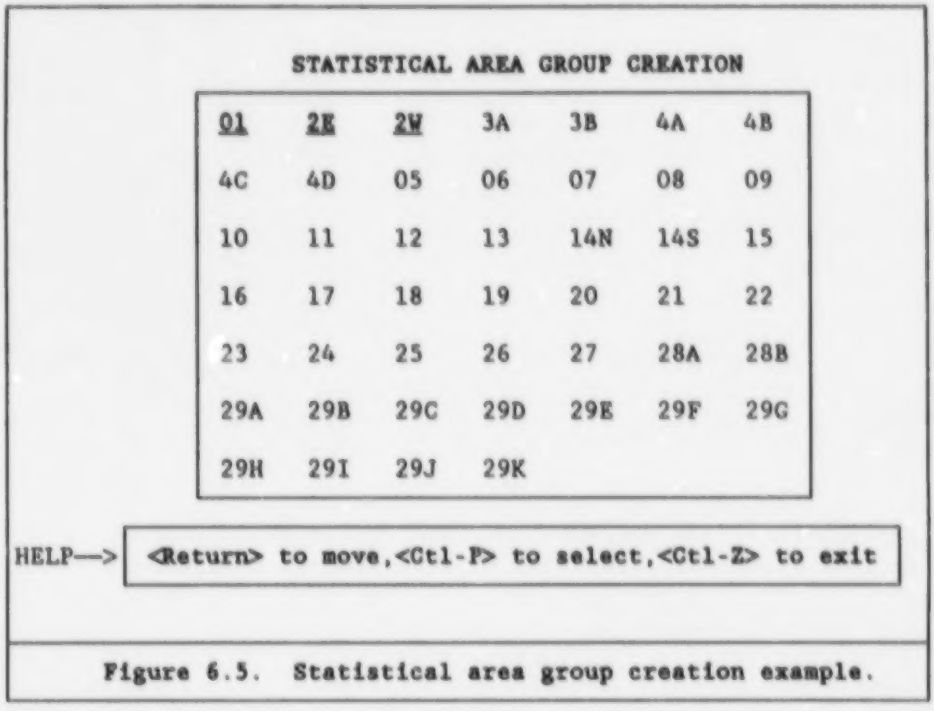


Figure 6.5. Statistical area group creation example.

A report on the above group consists of all rabcodes that lie within statistical areas 01, 2E and 2W, or equivalently, the Queen Charlotte Islands.

The resulting record in the NORTHSTRS.GRP file is S03 01 2E 2W *.

6.2.4 Group Type 4: Individual Rabcode(s)

This group consists of individual rabcodes and is created using the Grouping by Individual Streams Screen (Figure 6.6).

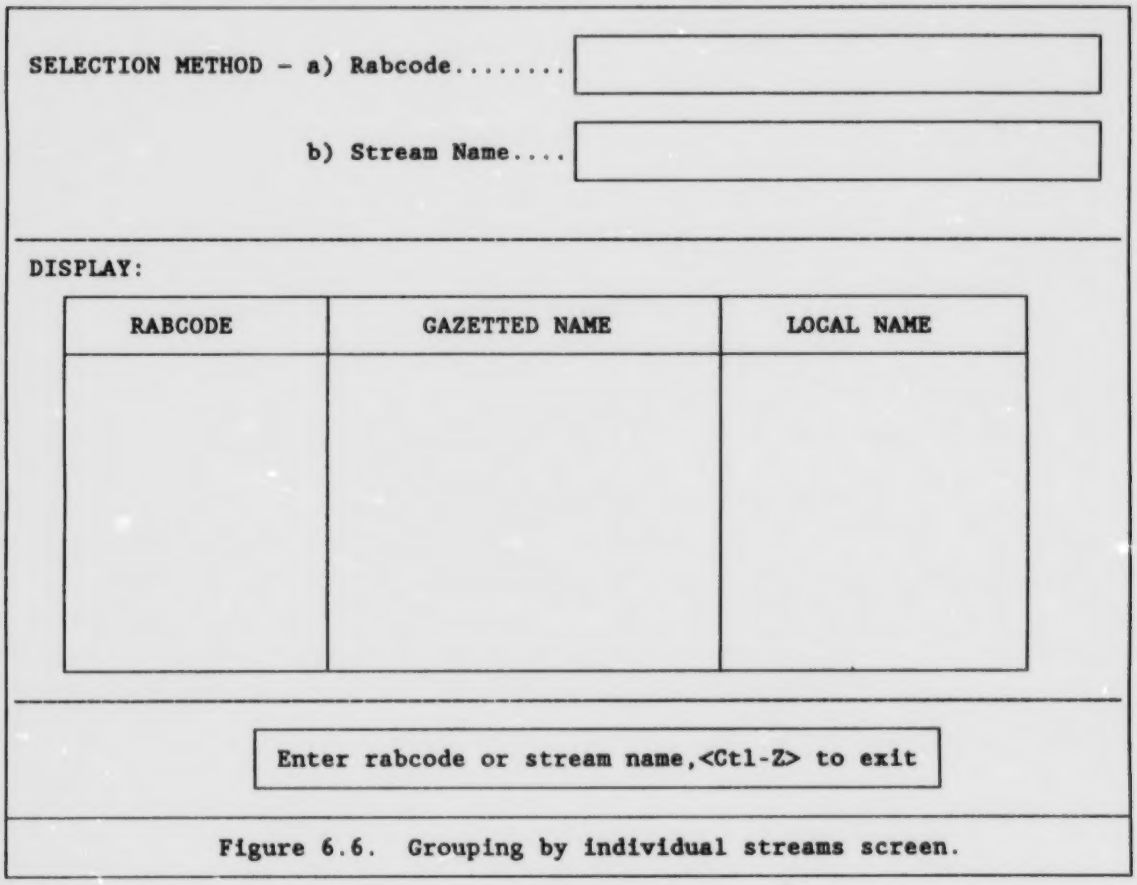


Figure 6.6. Grouping by individual streams screen.

This screen consists of two parts, a selection method section and a display section. Stream selection can be accomplished in two ways. If the rabcode is known (e.g., 42-0000) it can be entered in the rabcode-entry box. The rabcode and its associated gazetted and local name will then appear in the display portion of the screen. For an example, see Figure 6.7.

DISPLAY:

Rabcode	Gazetted Name	Alternate Name
42-0000	Lakelse River	

Figure 6.7. Stream name display from rabcode entry example.

If the rabcode is unknown, the user hits <Return> and then enters either a creek name or a creek name segment in the stream-name entry box. The first time the stream-name entry method is invoked, a 5 second delay occurs as all gazetted and local names in the stream master are loaded into memory. All the occurrences of that name or name segment are subsequently displayed in the display section of the screen.

For example, suppose the user wants to include the Kitseguelca River in the group being created but does not know either its rabcode or the correct spelling of its name. Typing in that portion of the name that is accurately known (e.g., **Kits**) and hitting <Return>, results in all streams having either a gazetted or local name segment matching '**kits**' being displayed. For an example, see Figure 6.8.

RABCODE	GAZETTED NAME	LOCAL NAME
43-0000-000-000-000-000-991	Kitsumkalum Lake	Kalum Lake
43-0000-000-000-000-000-992	Kitsumkalum River	Beaver River
43-0000-000-000-000-000-993	Kitsumkalum River	Kalum River
45-0000	Kitseguecla River	Kitsegukla River
93-2300-030	Kitsucksus Creek	Kitsucksis Creek
96-2100	Kitsault River	Kitsault River

Figure 6.8. Stream segment match display.

Hitting <Return> three times to skip Kalum Lake, Beaver River, and Kalum River and then typing <CTL-P>, selects the Kitseguecla River. Typing <Ctl-Z> terminates stream selection for this display. All selections that have been made thus far are subsequently displayed (Figure 6.9) and the user is reprompted for entry method.

DISPLAY:

Rabcode	Gazetted Name	Alternate Name
42-0000	Lakelse River	
45-0000	Kitseguecla River	

Figure 6.9. Stream selection display example.

Typing <CTL-Z> at either the rabcode or stream name entry prompt terminates stream selection. Each stream selected using the 'Grouping by individual stream' screen (Figure 6.6) constitutes one record or subgroup in the group file being constructed. For the current example, two records would be created and added to the NORTHSTRS.GRP file:

1) Record #1: R 42-0000*
2) Record #2: R 45-0000*

The resulting NORTHSTRS.GRP file formed from the 5 subgroups created in this chapter consists of the following 5 records:

1) R1 47-0000:49-0000*
2) R2 70-0000*
3) S03 01 2E 2W *
4) R 42-0000*
5) R 45-0000*

A detailed report for this group consists of a listing by creek, within subgroup, as prescribed by the report-design and restrictions screen selections.

A summary report consists of one page of grand totals, all subgroups combined. For an example, see Figure 6.10.

BC16 SALMON ESCAPEMENT REPORT
GROUP:NORTHSTRS (329 STREAMS)

YEAR	SOCKEYE	COHO	PINK	CHUM	CHINOOK
1953	852348	50929	190100	314692	11975
1954	668478	110245	1552550	617600	12425
1955	92100	85610	322750	74175	15375
1956	445986	104790	989400	139978	16625
1957	822296	103795	796525	435240	37625
1958	1153713	148075	1087300	274135	30125
1959	992666	97510	1190654	70692	30400
1960	337740	129847	797475	231756	9727
1961	969132	186844	814125	300575	9075
1962	626396	120847	1712875	370798	5530
1963	776785	126999	795975	363833	7275
1964	1260757	249990	1901870	747780	13325
1965	859285	287605	1186029	443003	22730
1966	586872	242350	2280792	601552	17410
1967	846661	145196	452660	416281	24365
1968	898559	142705	3479263	478116	20851
1969	1208610	137195	757300	323409	30155
1970	1061605	178650	2271110	334640	19025
1971	1411474	91085	824600	348683	16475
1972	1056928	105023	2407091	276730	18696
1973	1220241	129618	1082347	331481	10021
1974	1158475	143714	1066136	240985	9601
1975	917398	125059	1326557	155748	11160
1976	766688	240472	1338946	234868	6428
1977	1381037	138344	723374	273323	9978
1978	613803	168232	1328112	323822	9781
1979	1387572	90666	460750	133532	8747
1980	706989	72628	1421376	269325	10560
1981	1694357	75494	1085435	240760	10646
1982	1382650	97624	1191803	367463	7492
1983	1083657	82677	2534978	228936	9875
1984	1251293	98943	2435876	403634	15712
1985	2564297	92097	1323509	440189	12686
1986	891340	107827	3184799	446955	22778
1987	1665652	94285	1929721	436651	15638
1988	1572828	70288	1902971	353825	16779
TOTALS:	37186668	4673258	50147134	12045165	557071

Figure 6.10. Stream group summary report example.

6.3 EXAMINING GROUPS

The constitution of an existing stream group may need to be examined before a group report is generated. This is accomplished by typing an E and entering the group name on the Stream Group Maintenance screen, Figure 6.1. For example, suppose the contents of the stream group NORTHSTRS is to be examined. Entering NORTHSTRS at the group name prompt produces Figure 6.11.

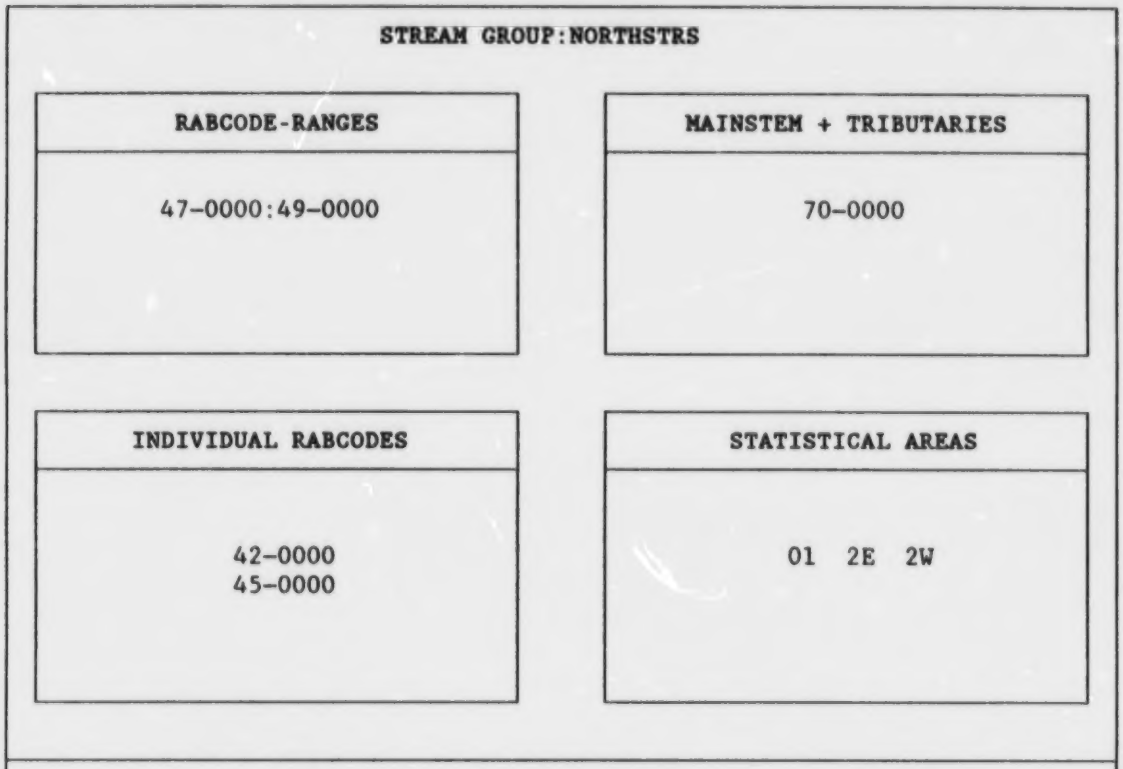


Figure 6.11. Examining a stream group example.

If more than 10 occurrences of a particular subgroup exist, the user can scroll the subgroup(s) by hitting <RETURN>. Typing <CTL-Z> exits from this module.

6.4 MODIFYING GROUPS

To modify a stream group, the user enters an M at the 'Desired Mode' prompt of Figure 6.1 and then enters the group name to be modified. After the selection of grouping method, the user is prompted as to whether the group modification is a subgroup addition, a subgroup deletion or a subgroup modification. If an addition, a new record is added to the end of that group's file. If a deletion, the appropriate record is deleted from the file. If a modification, the user is prompted for the old subgroup and the new subgroup. The appropriate record in the file is subsequently overwritten.

6.5 DELETING GROUPS

In the event that a stream group is no longer needed, the user enters a D at the 'Desired Mode' prompt and then the group to be deleted. The file in the current directory having that filename + the extension .GRP will then be deleted.

6.6 COMPARING GROUPS

In the event that a comparison of groups is desired, the following steps are taken:

1) Step 1. The groups that are to be compared are created using the User-defined group module, selection 3 of the Main Menu. For example, to compare the escapements of the Skeena River System to those of the Nass River System, two groups would be created each consisting of 1 mainstem record:

a) Group 1: Skeena (File = SKEENA.GRP consisting of 1 record, R2 40-0000*)

b) Group 2: Nass (File = NASS.GRP consisting of 1 record, R2 70-0000*)

2) Step 2. The user exits from the User-defined group module and enters the Report Design Module, selection 1 of the Main Menu. User-defined group is selected as row and species as column. After the species (e.g., sockeye, coho, pink), the stream groups (e.g., Skeena, Nass) and the years (e.g., 86, 87) are selected, the report shown in Figure 6.12 is produced. The report shows the total number of streams in each group and, by species within year, the total number of streams, the total escapements, and the percentage contributions to the total escapement of all groups combined.

BC16 SALMON ESCAPEMENT
GROUP REPORT

YEAR:86

GROUP		#STRS	SOCKEYE STREAMS	SOCKEYE ESC.	SOCKEYE %	COHO STREAMS	COHO ESC.	COHO %	PINK STREAMS	PINK ESC.	PINK %
SKEENA		171	35	708889	79.1	58	50263	65.6	56	2131079	98.3
NASS		41	5	187216	20.9	18	26360	34.4	12	35950	1.7
	TOTALS:	212	40	896105		76	76623		68	2167029	

YEAR:87

GROUP		#STRS	SOCKEYE STREAMS	SOCKEYE ESC	SOCKEYE %	COHO STREAMS	COHO ESC	COHO %	PINK STREAMS	PINK ESC	PINK %
SKEENA		171	41	1479293	88.9	42	31835	59.4	58	3128759	95.1
NASS		41	6	184212	11.1	17	21800	40.6	19	162496	4.9
	TOTALS:	212	47	1663505		59	53635		77	3291255	

Figure 6.12. Comparing stream groups example.

CHAPTER 7 SPECIAL REPORTS MODULE

Reports requiring more than totalling or averaging of escapements fall beyond the scope of the report design module. The Special Reports module, Figure 7.1, is used to access these reports.

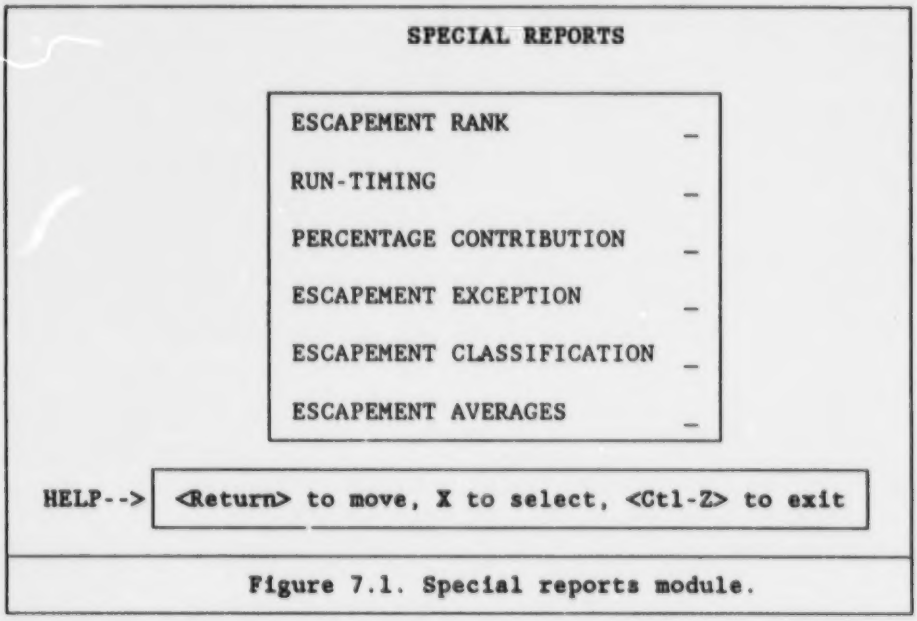


Figure 7.1. Special reports module.

Six restrictions screens exist, one for each of escapement rank, run-timing, percentage-contribution, escapement exception, escapement classification and escapement averages. Each restrictions screen is essentially a rabcode report restrictions screen (Figure 4.2), with some additional restrictions added. Following is a brief description of each restrictions screen, with an example session and output.

7.1 ESCAPEMENT RANK

The escapement rank report restrictions screen requires the operator to select a ranking method (i.e., rank by mean or by total escapement). Output consists of all streams in the input stream group ranked in descending order of escapement. Only those streams that have a positive escapement are reported. The report format is fixed. Rabcodes form the rows, species form the pages. For an example screen session, see Figure 7.2.

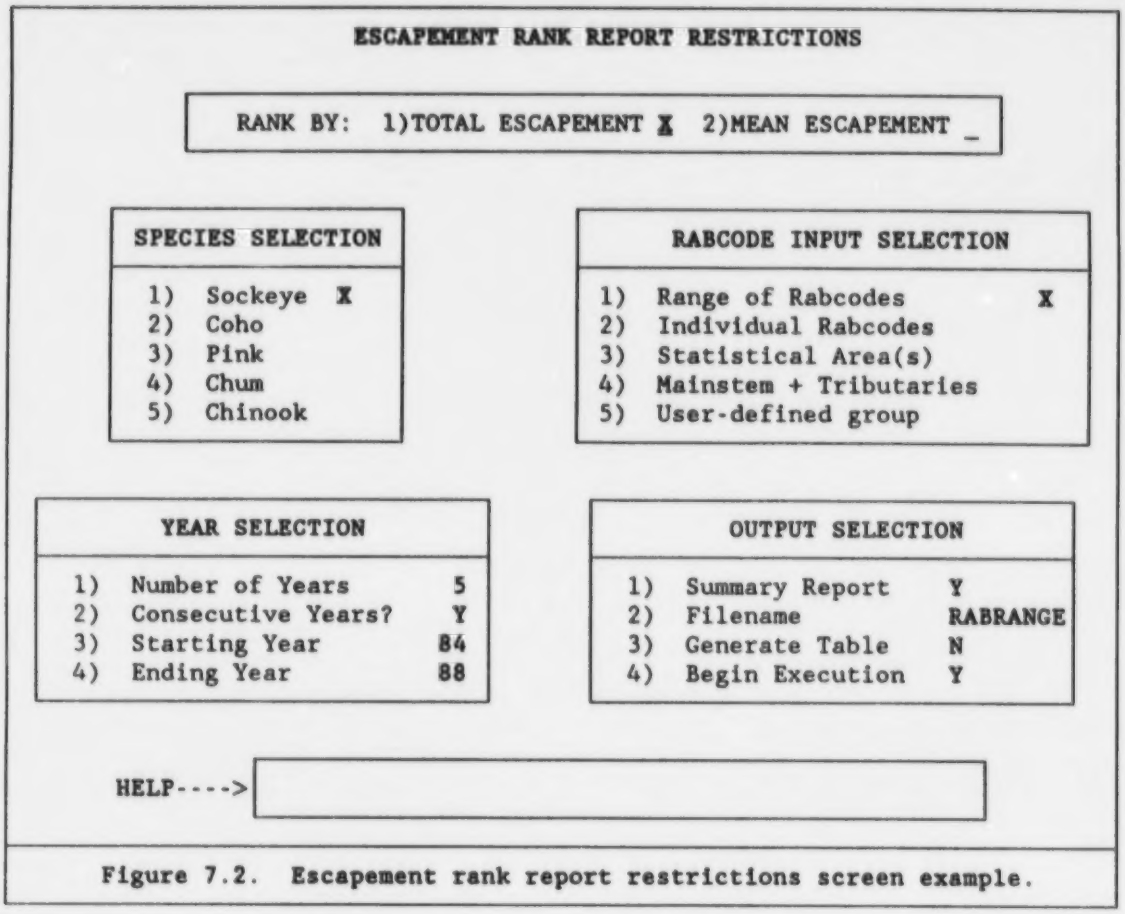


Figure 7.2. Escapement rank report restrictions screen example.

The output resulting from the restrictions applied in Figure 7.2. is Figure 7.3.

SOCKEYE STREAMS LISTED IN DESCENDING
ORDER OF TOTAL ESCAPEMENT (1984-1988)

RABCODE-RANGE:93-4100 TO 93-5500-300-150
DESCRIPTION:CYPRE TO GOLD

TOTAL# OF STREAMS SURVEYED:35

RABCODE	GAZETTED NAME	LOCAL NAME	SUBD.	TOTAL ESCAPEMENT	RANK
93-5500	GOLD RIVER		25	31039	1
93-5500-300-150	OKTWANCH RIVER	OKTWANCH RIVER	25	6500	2
93-4600	MEGIN RIVER	MEGIN RIVER	24	2500	3
93-5500-300	MUCHALAT RIVER	MUCHALAT RIVER SYSTEM	25	1500	4
93-5400	BURMAN RIVER	BURMAN RIVER	25	1050	5
93-5260	MOOYAH RIVER	MOOYAH BAY CREEK	25	20	6
93-4700	ICE RIVER	ICE RIVER	24	15	7
93-4800	SYDNEY RIVER	IRVING RIVER	24	8	8
93-4570	WATTA CREEK	WATTA CREEK	24	6	9
93-4300	MOYEHA RIVER	MOYEHA RIVER	24	4	10
93-4100	CYPRE RIVER	CYPREO RIVER	24	3	11
			TOTAL:	42645	

Figure 7.3. Stream rank report by total escapement example.

7.2 RUN TIMING

The run-timing report restrictions screen requires the operator to select any combination of arrival, start, peak, and end of spawning dates. Output consists of all streams in the specified stream cluster that have at least one of the selected spawning dates present. Report format is fixed. Rabcodes form the rows, years form the pages. For an example screen session see Figure 7.4.

RUN-TIMING REPORT RESTRICTIONS

RUN-TIMING: ARRIVAL _ START X PEAK X END X

SPECIES SELECTION	
1) Sockeye	X
2) Coho	X
3) Pink	
4) Chum	
5) Chinook	

RABCODE INPUT SELECTION	
1) Range of Rabcodes	
2) Individual Rabcodes	
3) Statistical Area(s)	
4) Mainstem + Tributaries	X
5) User-defined group	

YEAR SELECTION	
1) Number of Years	1
2) Consecutive Years?	Y
3) Starting Year	87
4) Ending Year	87

OUTPUT SELECTION	
1) Summary Report	Y
2) Filename	KISPIOX
3) Generate Table	N
4) Begin Execution	Y

HELP---->

Figure 7.4. Run-timing report restrictions screen example.

The output resulting from the restrictions applied in Figure 7.4 is Figure 7.5.

BC16 SALMON ESCAPEMENT RUN-TIMING REPORT (1987)

MAINSTEM:KISPIOX RIVER
RABCODE:47-0000

RABCODE	STREAM NAME	SUBD	SPECIES	START	PEAK	END
47-0000	KISPIOX RIVER	4C	COHO	OCT 15	NOV 1	NOV 15
47-0100	DATE CREEK	4C	COHO	OCT 15	OCT 30	NOV 15
47-0140	MCQUEEN CREEK	4C	COHO	OCT 1	OCT 15	NOV 15
47-0200	MCCULLY CREEK	4C	COHO	OCT 15	OCT 30	NOV 15
47-0300	MURDER CREEK	4C	COHO	OCT 15	OCT 30	NOV 15
47-0500	IRONSIDE CREEK	4C	COHO	OCT 10	OCT 30	NOV 15
47-0800	SKUNSNAT CREEK	4C	COHO	OCT 15	OCT 30	NOV 15
47-0900	CLIFFORD CREEK	4C	COHO	OCT 15	OCT 30	NOV 15
47-1100	SWEETIN RIVER	4C	COHO	SEP 15	OCT 1	OCT 15
47-1200	BEAVERLODGE CREEK	4C	COHO	OCT 15	OCT 30	NOV 15
47-1400	NANGEESE RIVER	4C	COHO	OCT 15	NOV 1	NOV 15
47-1800	STEPHENS CREEK	4C	SOCKEYE	SEP 1	SEP 15	OCT 15
			COHO	OCT 1	OCT 15	NOV 15
47-1800-030-000-000-000-991	CLUB CREEK (LOWER)	4C	SOCKEYE	SEP 1		
			COHO	SEP 20	OCT 10	OCT 30
47-1800-030-000-000-000-992	CLUB CREEK (UPPER)	4C	SOCKEYE	SEP 1		
			COHO	SEP 20	OCT 10	OCT 30
47-1800-030-060	WESACH CREEK	4C	COHO	OCT 5	NOV 15	DEC 5

Figure 7.5. Run-timing report example.

7.3 PERCENTAGE CONTRIBUTION

The percentage contribution report restrictions screen requires the operator to specify between 1 and 3 percentage levels. For an example screen session see Figure 7.6.

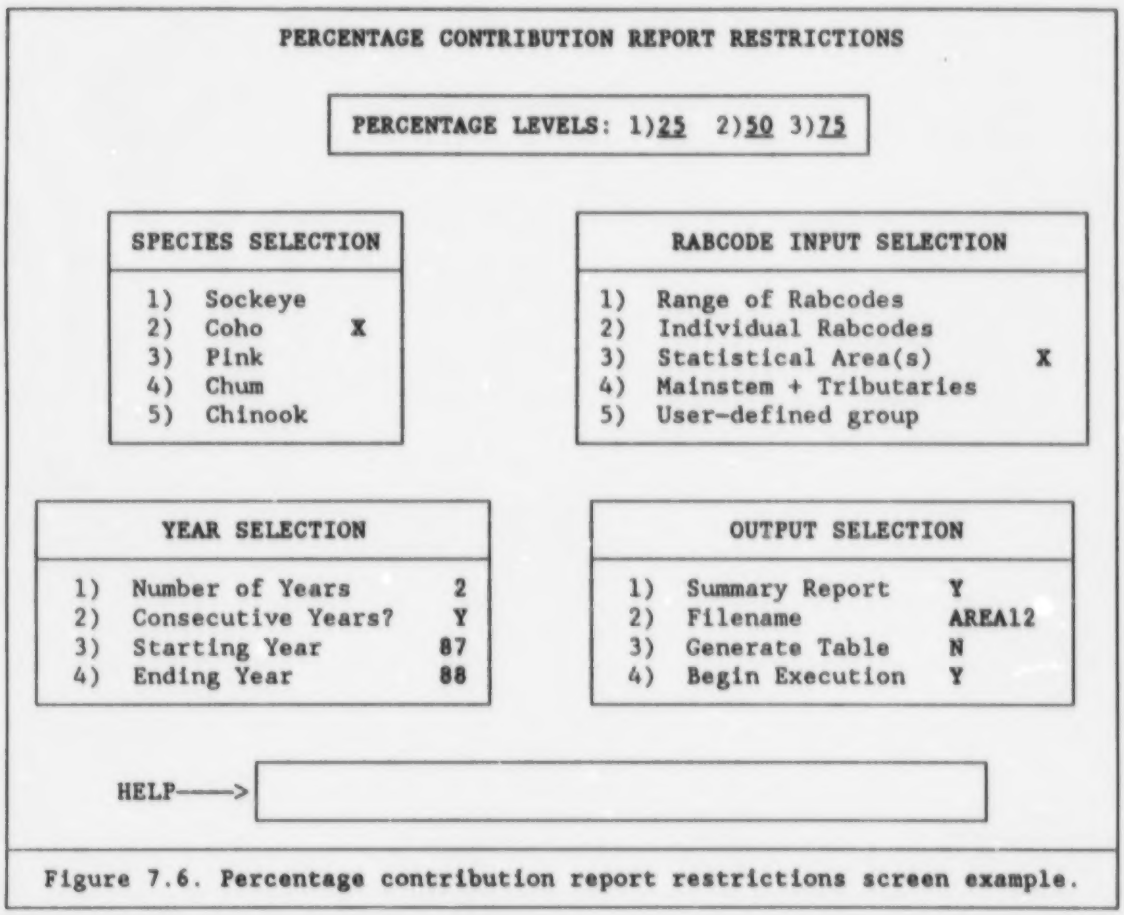


Figure 7.6. Percentage contribution report restrictions screen example.

The output resulting from the restrictions applied in Figure 7.6 consists of 3 separate reports:

1) A report that shows the minimum number of streams and the cumulative escapement required to account for the specified percentages of the total escapement to the specified aggregate of streams.(Figure 7.7).

BC16 SALMON ESCAPEMENT PERCENTAGE-CONTRIBUTION REPORT
STAT. AREA:12

SPECIES:COHO

YEAR	TOTAL # OF COHO STREAMS	MINIMUM # OF STREAMS REQUIRED TO ACCOUNT FOR 25% ESC	50% ESC	75% ESC	TOTAL ESC
87	19	2 6100	3 9100	4 11600	15173
88	18	1 12000	1 12000	3 17000	22250

TOTAL# OF STREAMS SURVEYED: 82
NUMBER OF DIFFERENT COHO STREAMS (1987-1988): 19

(NOTE:THE TOTAL # OF COHO STREAMS = # OF STREAMS THAT RECORDED AN ESCAPEMENT > 0)

Figure 7.7. Percentage contribution report example.

2) A listing of all the streams that had a positive escapement for the selected species at least once in the range of years specified. (Figure 7.8).

SPECIES:COHO
YEARS:1987-1988
STAT. AREA:12

RAOCODE	GAZETTED NAME	LOCAL NAME	SUBD.	AVG. ESC.
90-6100	KAKWEIKEN RIVER	KAKWEIKEN RIVER	12	7250
90-6300-250	GILFORD CREEK	FRASER CREEK	12	3500
90-6300-370		SCOTT COVE CREEK	12	2250
90-8500	KINGCOME RIVER	KINGCOME RIVER	12	1800
90-6900	WAKEMAN RIVER	WAKEMAN RIVER	12	1800
92-1300	NIMPKISH RIVER	NIMPKISH RIVER	12	1500
92-1000	KEOGH RIVER	KEOGH RIVER	12	600
90-5600	KWALATE CREEK	KWALATE RIVER	12	400
92-1210	MILLS CREEK	BEAR CREEK	12	350
92-0300	NAHWITTI RIVER	NAHWITTI RIVER	12	262
92-1100	CLUXEWE RIVER	CLUXEWE RIVER	12	225
92-1400	KOKISH RIVER	KOKISH RIVER	12	200
90-4900-010	GLENDALE CREEK	GLENDALE CREEK	12	125
92-0900	QUATSE RIVER	QUATSE RIVER	12	100
90-5500	ANNUHATI RIVER	ANNUHATI RIVER	12	87
90-6210	AHTA RIVER	WATERFALL CREEK	12	87
90-6600	CHARLES CREEK	CHARLES CREEK	12	50
90-7200	EMBLEY CREEK	EMBLEY LAGOON RIVER	12	50
90-7450		TANCRED CREEK	12	16

Figure 7.8. Listing of all coho streams example.

3) A report for the last year of the selected year range listing the streams in descending order of escapement, with the percentage cutoff points highlighted. (Figure 7.9).

COHO PERCENTAGE-CONTRIBUTION REPORT (1988)

RABCODE	GAZETTED NAME	LOCAL NAME	SUBD.	ESC.	
90-6100	KAKWEIKEN RIVER	KAKWEIKEN RIVER	12	12000	
					--25&50% 12000
90-6300-250	GILFORD CREEK	FRASER CREEK	12	3500	
90-6300-370		SCOTT COVE CREEK	12	1500	
					-----75% 17000

Figure 7.9. Contribution report by ranked streams example.

7.4 ESCAPEMENT EXCEPTION

The escapement exception report restrictions screen requires the operator to specify the lower and upper bounds for the species of interest. Output consists of streams whose species escapements fall within these bounds. The report lists the streams in descending order of escapement by year. The report format is fixed. Rabcodes form the rows, species form the pages. For an example screen session see Figure 7.10.

ESCAPEMENT EXCEPTION REPORT RESTRICTIONS

SPECIES SELECTION

_____	< SOCKEYE <-	_____
100	< COHO <-	_____
_____	< PINK <-	_____
_____	< CHUM <-	_____
_____	< CHINOOK <-	_____

RABCODE INPUT SELECTION

1)	Range of Rabcodes	
2)	Individual Rabcodes	
3)	Statistical Area(s)	
4)	Mainstem + Tributaries	X
5)	User-defined group	

YEAR SELECTION

1)	Number of Years	1
2)	Consecutive Years?	Y
3)	Starting Year	88
4)	Ending Year	88

OUTPUT SELECTION

1)	Summary Report	Y
2)	Filename	SKEENA
3)	Generate Table	N
4)	Begin Execution	Y

HELP---->

Figure 7.10. Escapement exception report restrictions screen.

The report resulting from the restrictions applied in Figure 7.10 is Figure 7.11.

COHO ESCAPEMENT EXCEPTION REPORT
(100 <= ESCAPEMENT)

MAINSTEM:SKEENA RIVER
RABCODE:40-0000

YEAR:88

RABCODE	GAZETTED NAME	LOCAL NAME	SUBD	ESCAPEMENT
42-0000	LAKELSE RIVER	LAKELSE RIVER	4B	4000
48-0000-000-000-000-000-998	BABINE RIVER	UPPER BABINE RIVER	4D	3027
40-0100	ECSTALL RIVER	ECSTALL RIVER	4A	500
40-0600	GITNADOIX RIVER	GITNADOIX RIVER	4B	500
43-0000-000-000-000-000-993	KITSUMKALUM RIVER	KALUM RIVER	4B	500
46-2400	TOBOGGAN CREEK	TOBOGGAN CREEK	4D	450
48-6400	FULTON RIVER	FULTON RIVER	4D	327
40-0500	KASIKS RIVER	KASIKS RIVER	4B	300
40-1030	THORNHILL CREEK	THORNHILL CREEK	4C	200
43-1500	CEDAR RIVER	CEDAR RIVER	4B	200
43-1300	DOUGLAS CREEK	DRY CREEK	4B	110
46-3800	TELKWA RIVER	TELKWA RIVER	4D	100
47-0000	KISPIOX RIVER	KISPIOX RIVER	4C	100
47-1400	NANGEESE RIVER	NANGEESE RIVER	4C	100

Total # of streams:14

Figure 7.11. Coho escapement exception report example.

7.5 ESCAPEMENT CLASSIFICATION

The escapement classification report restrictions screen requires the operator to specify the upper and lower bounds for small, medium, and large escapement classes. For an example screen session see Figure 7.12. Output consists of streams ranked in descending order of average escapement, within class. Only one species permitted per report. Report format is fixed. Rabcodes form the rows, species the page.

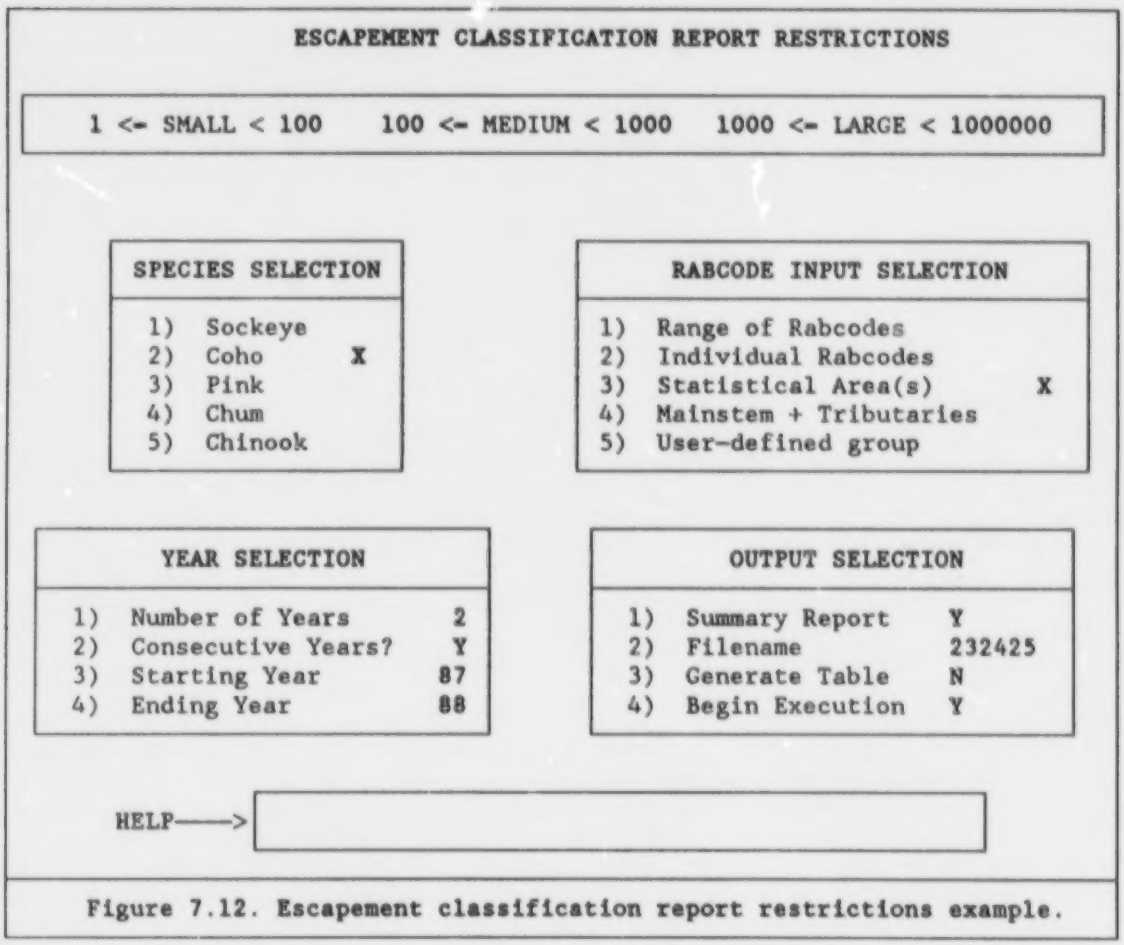


Figure 7.12. Escapement classification report restrictions example.

The following three reports result from the restrictions applied in Figure 7.12.:

1) Coho escapement classification report with class = small.(Figure 7.13).

COHO ESCAPEMENT CLASSIFICATION REPORT

STAT. AREAS:23 24 25

YEARS:1987-1988

CLASS: SMALL (1 <= AVG. ESCAPEMENT < 100)

RABCODE	GAZETTED NAME	LOCAL NAME	SUBD	AVERAGE ESCAPEMENT
93-4480		ATLEO RIVER	24	80
93-2030		CARNATION CREEK	23	77
93-6900	PARK RIVER	QUEEN COVE CREEK	25	75
93-4000	BEDWELL RIVER	BEDWELL RIVER	24	68
93-4800	SYDNEY RIVER	IRVING RIVER	24	62
93-6500-750	OWOSSITSA CREEK	OWOSSITSA CREEK	25	50
93-3897		WARN BAY CREEK	24	37
93-6500-780	BRODICK CREEK	GARDEN POINT CREEK	25	37
93-6920		HAMMOND CREEK	25	37
93-5950	CANTON CREEK	CANTON CREEK	25	35
93-3400	SANDHILL CREEK	SANDHILL CREEK	24	32
93-2000	SARITA RIVER	SARITA RIVER SYSTEM	23	25
93-4570	WATTA CREEK	WATTA CREEK	24	25
93-4600	MEGIN RIVER	MEGIN RIVER	24	25
93-4700	ICE RIVER	ICE RIVER	24	25
93-4930		HESQUIAT HARBOUR CREEKS	24	25
93-6812		CHUM CREEK	25	25
93-2000-020		FREDERICK CREEK	23	1
93-4170		BAWDEN BAY CREEK	24	1

TOTAL # STREAMS:19 TOTAL: 752

Figure 7.13. Example of coho classification report for class = small.

2) Coho escapement classification report with class = medium.(Figure 7.14).

COHO ESCAPEMENT CLASSIFICATION REPORT

STAT. AREAS:23 24 25

YEARS:1987-1988

CLASS:MEDIUM (100 <= AVG. ESCAPEMENT < 1000)

RABCODE	GAZETTED NAME	LOCAL NAME	SUBD	AVERAGE ESCAPEMENT
93-5400	BURMAN RIVER	BURMAN RIVER	25	750
93-6400	TAHSIS RIVER	TAHSIS RIVER	25	749
93-6390	LEINER RIVER	RUSSIAN RIVER	25	550
93-3500	KOOTOWIS CREEK	KOOTOWIS CREEK	24	500
93-4100	CYPRE RIVER	CYPREO RIVER	24	375
93-6700	ZEBALLOS RIVER	ZEBALLOS RIVER	25	300
93-6000	SUCWOA RIVER	SUCWOA RIVER	25	295
93-3100	TOQUART RIVER	MAIN RIVER	23	250
93-3600-070	STAGHORN CREEK	STAGHORN CREEK	24	250
93-6300	TSOWWIN RIVER	SANDPOINT CREEK	25	225
93-3600	TRANQUIL CREEK	TRANQUIL CREEK	24	202
93-6500-585		BLACK CREEK	25	175
93-3200		MAGGIE RIVER SYSTEM	23	150
93-6600	LITTLE ZEBALLOS RIVER	LITTLE ZEBALLOS RIVER	25	150
93-6925	ELIZA CREEK	PORT ELIZA #1	25	150
29-8654	MURIEL LAKE	MURIEL LAKE	24	144
93-3380	LOST SHOE CREEK	LOST SHOE CREEK	24	125
93-6100		DESERTED CREEK	25	125
93-6780	MAMAT CREEK	MAMAT CREEK	25	125
93-4300	MOYEHA RIVER	MOYEHA RIVER	24	100
93-5260	MOOYAH RIVER	MOOYAH BAY CREEK	25	100
93-5600	KLEEPTEE CREEK	KLEEPTEE CREEK	25	100
93-5800	TLUPANA RIVER	TLUPANA RIVER	25	100
93-6500-580		RANSOM CREEK	25	100
93-6800	ESPINOSA CREEK	ESPINOSA CREEK	25	100

Total # streams:25 TOTAL: 6190

Figure 7.14. Example of coho classification report for class = medium.

3) Coho escapement classification report with class = large.(Figure 7.15)

COHO ESCAPEMENT CLASSIFICATION REPORT

STAT. AREAS:23 24 25

YEARS:1987-1988

CLASS: LARGE (1000 <= AVG. ESCAPEMENT < 1000000)

RABCODE	GAZETTED NAME	LOCAL NAME	SUBD	AVERAGE ESCAPEMENT
93-5900	CONUMA RIVER	CONUMA RIVER	25	4500
93-3600-000-000-000-000-993	KENNEDY RIVER	KENNEDY RIVER (UPPER)	24	1800
93-5500	GOLD RIVER		25	1500
93-3300	THORNTON CREEK		23	1007

Total # of streams:4 TOTAL: 8807

Figure 7.15. Example of coho classification report for class = large.

7.6 ESCAPEMENT AVERAGES

The escapement averages report restrictions screen is the same as the rabcode restrictions screen (Figure 4.2). Output consists of the average escapements for all species selected, for the range of years specified. Beside each average escapement is the number of years used in computing the average. Years when no report was filed or years when escapements were deemed unknown are not included in averaging. For an example screen session see Figure 7.16.

ESCAPEMENT AVERAGES REPORT RESTRICTIONS

SPECIES SELECTION	
1) Sockeye	
2) Coho	X
3) Pink	
4) Chum	X
5) Chinook	

RABCODE INPUT SELECTION	
1) Range of Rabcodes	
2) Individual Rabcodes	
3) Statistical Area(s)	X
4) Mainstem + Tributaries	
5) User-defined group	

YEAR SELECTION	
1) Number of Years	10
2) Consecutive Years?	Y
3) Starting Year	79
4) Ending Year	88

OUTPUT SELECTION	
1) Summary Report	Y
2) Filename	AREA12
3) Generate Table	N
4) Begin Execution	Y

HELP---->

Figure 7.16. Escapement averages report restrictions screen example.

The output resulting from the restrictions applied in Figure 7.16 is Figure 7.17.

BC16 AVERAGE ESCAPEMENT REPORT

(YEARS:1980-1989)

STAT. AREA:20

TOTAL # OF STREAMS SURVEYED:24

RABCODE	STREAM NAME	SUBD	COHO	# YRS	CHUM	# YRS
29-0026	LUNSON CREEK	20	60	1	20	1
29-1000	BAKER CREEK	20	8	8	423	8
29-3108	LENA CREEK	20	0	0	0	0
93-0100	MATHESON CREEK	20	7	4	0	0
93-0250	AYUM CREEK	20	9	8	1530	10
93-0275	LANNON CREEK	20	8	6	2	1
93-0300	SOOKE RIVER	20	36	5	22450	10
93-0300-050	DE MAMIEL CREEK	20	692	10	9868	10
93-0300-050-030	ROCKY CREEK	20	102	8	570	7
93-0300-100	CHARTERS RIVER	20	17	6	1337	10
93-0380	TUGWELL CREEK	20	33	10	62	9
93-0400	MUIR CREEK	20	9	7	1014	10
93-0420	KIRBY CREEK	20	69	10	408	9
93-0600	JORDAN RIVER	20	0	0	0	0
93-0620	UGLOW CREEK	20	6	2	0	0
93-0624	MAIDENHAIR CREEK	20	4	3	0	0
93-1000	SAN JUAN RIVER	20	7990	10	1532	10
93-1000-030	FALLS CREEK	20	25	1	0	0
93-1000-050	MOSQUITO CREEK	20	75	1	0	0
93-1000-070-010	RENFREW CREEK	20	141	3	75	3
93-1000-120	HARRIS CREEK	20	3183	3	0	0
93-1000-120-150	HEMMINGSEN CREEK	20	2233	3	0	0
93-1000-150	LENS CREEK	20	400	1	0	0
93-1100	GORDON RIVER	20	638	9	1352	10
		GRAND TOTALS:	15745		40643	

Figure 7.17. Escapement averages report example.

7.7 EXAMPLES

Typical questions that can be answered using the Special Reports module are:

1) What were the start, peak, and end of spawning dates for all sockeye and coho streams in the Kispiox River System in 1987?

Procedure:

a) select 'Run Timing' as the report;
b) select sockeye and coho as species;
c) select 'Mainstem + Tributaries' as the rabcode-input method;
d) select Kispiox River (Rabcode = 47-0000) as the mainstem;
e) select 87 as the starting year and 87 as the ending year.

The output is Figure 7.5.

2) How many streams in the Skeena River System had a coho escapement greater than 100 in 1988?

Procedure:

a) select 'Escapement Exception' as the report;
b) select 100 as the lower bound;
c) select coho as species;
d) select 'Mainstem + Tributaries' as the rabcode-input method;
e) select Skeena River System (Rabcode = 40-0000) as the mainstem;
f) select 88 as the starting and ending year.

The output is Figure 7.11.

3) What were the average coho and chum escapements for the last 10 years to statistical area 12?

Procedure:

a) Select 'Escapement Averages' as the report.
b) Select coho and chum as species.
c) Select 'Statistical Area(s)' as the rabcode-input method.
d) Select area 12.
e) Specify 79 as the starting year and 88 as the ending year.

The output is Figure 7.17.

4) What are the minimum number of streams required to satisfy 25%, 50%, and 75% of the total coho escapement to statistical area 12 in the years 1987 and 1988?

Procedure:

a) select 'Percentage Contribution' as the report;

b) select 25, 50 and 75 as the percentage levels;
c) select coho as species;
d) select 'Statistical Area(s)' as the rabcode-input method;
e) select area 12;
f) select 87 as the starting year and 88 as the ending year;

The output is Figure 7.7.

5) Rank the sockeye streams by total escapement for the five years 1984 thru 1988 for the streams with rabcodes bounded by 93-4100 and 93-5500-300-150?

Procedure:
a) select 'Escapement Rank' as the report;
b) select Total Escapement as the ranking method;
c) select sockeye as species;
d) select 'Rabcode-range' as the rabcode-input method;
e) select Cypre River (Rabcode = 93-4100) as starting rabcode and Gold River (Rabcode = 93-5500-300-150) as ending rabcode;
f) select 84 as the starting year and 88 as the ending year;

The output is Figure 7.3.

6) Classify the average coho escapements to streams in areas 23, 24 and 25 for the years 87 and 88 according to (small: 1 <= avg. esc < 100), (medium: 100 <= avg. esc. < 1000) and (large: 1000 <= avg. esc.)?

Procedure:
a) select 'Run Classification' as the report;
b) select upper and lower bounds for small, medium and large;
c) select coho as species;
d) select 'Statistical Area(s)' as the rabcode-input method;
e) select areas 23, 24 and 25;
f) select 87 as the starting year and 88 as the ending year.

The output consists of Figure 7.13, Figure 7.14, and Figure 7.15.

CHAPTER 8 SUBROUTINE OVERVIEW

A number of general purpose Fortran subroutines have been written that allow application program development by users that are not extensively familiar with the salmon escapement database. These subroutines are contained in an escapement library, ESC.OLB. Once a program has been written and compiled accessing any of these subroutines then, assuming there are no subroutine calls to other libraries, the required linkage statement is:

$LINK program name + [SALMON.ESC.LIB] ESC/LIB

Below is a list of the library subroutines along with a brief functional description of each. Following that is a more detailed description of each subroutine, showing the arguments passed and returned, an example subroutine call, access restrictions, etc.

8.1 BRIEF DESCRIPTION OF SUBROUTINES

1) Openstrmast - opens the stream master file.

2) Openbc16 - opens 1 year of BC16 salmon escapement data.

3) Openrollup - opens the statistical area rollup file.

4) Openesconly - opens the file containing escapements only.

5) Readstrmast -supplied rabcode, reads a stream master record.

6) ReadBc16 - supplied rabcode and year (yy), reads a Bc16yy.dat record

7) Clearreportcom - clears the common block arrays involved in report generation.

8) Removedash - converts an external 27 digit rabcode to an internal 21 digit rabcode.

9) Insertdash - converts an internal 21 digit rabcode to an external 27 digit rabcode.

10) Onerabesc - supplied rabcode and starting and ending years, returns all escapements for the given year range.

11) Fndallstr - returns all stream master information of all creeks having a given stream name.

12) Getsubdstrs - supplied statistical area, returns the rabcodes and names of all streams in that area and the total number of streams.

13) Subdesc - supplied statistical area and year, returns the total escapements by species.

14) Inspections - supplied rabcode, returns the first and last years inspected, years inspected and not inspected, and the total number of years inspected and not inspected.

15) Getmethods - supplied rabcode and starting and ending years, returns enumeration methods uesd to estimate escapements.

16) Getoptimum - supplied rabcode, returns the optimal escapements for species that spawn in that stream.

17) Cycles - supplied rabcodes, year, cycle length and species, returns escapements for the maximum number of cycles.

18) Spawndates - supplied rabcode and starting and ending years, returns the arrival, start, peak, and end of spawning dates.

19) Maxmin - supplied an array of rabcodes and a starting and ending year, returns the maximum escapements, minimum escapements, and the average escapements over the specified range of years.

20) Validsubd - determines the validity of a subdistrict code.

21) Getdistrict - supplied subdistrict, returns the name and number of the conservation district in which it is located.

22) Checkrab - supplied rabcode, determines if it resides on the stream master.

23) Calcavg - supplied rabcodes, starting year, and averaging period, returns average escapements.

24) Gettribs - supplied rabcode, returns the names and subdistricts of all tributaries.

25) Getrangerabs - supplied a starting and an ending rabcode, returns the names and subdistricts of all streams whose rabcodes fall within the range.

8.2 SUBROUTINES

Openstrmast

Source file name : OPENSTRMAST

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Opens the stream master file.

Arguments Passed : None.

Arguments Returned : None.

Subroutine call example :

```
CALL OPENSTRMAST
```

Access restrictions : None.

Error condition codes : None.

Special considerations : File is opened on unit 22.

Openbc16

Source file name : OPENBC16

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Opens one year of BC16 escapement data.

Arguments Passed :

IYEAR	INTEGER*4.....	The year of escapement data to be opened.

Arguments Returned :

IERR	INTEGER*4.....	The error flag.

Subroutine call example :
Call OPENBC16 (IYEAR,IERR)

Access restrictions : None.

Error condition codes :

IERR = 0	No error.
IERR = 1	Invalid year.

Special considerations : File is opened on unit 30.

Openrollup

Source file name : OPENROLLUP

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Opens the statistical area rollup file.

Arguments Passed : None.

Arguments Returned : None.

Subroutine call example :
```
CALL OPENROLLUP .
```

Access restrictions : None.

Error condition codes : None.

Special considerations : File is opened on unit 40.

Openesconly

Source file name : OPENESCONLY

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Opens the indexed file containing all the escapements for all streams.

Arguments Passed : None.

Arguments Returned : None.

Subroutine call example :
CALL OPENESCONLY.

Access restrictions : None.

Error condition codes : None.

Special considerations : File is opened on unit 50.

Readstrmast

Source file name : READSTRMAST

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Supplied internal rabcode, this routine reads the stream master file and retrieves all stream master information for this stream.

Arguments Passed :

INTRAB	CHARACTER*21	The internal rabcode.

Arguments Returned :

GAZNAME	CHARACTER*30	The gazetted name.
LOCAL1	CHARACTER*30	The first local name.
LOCAL2	CHARACTER*30	The second local name.
SUBD	CHARACTER*4	The subdistrict.
STATUS	CHARACTER*1	The stream status.
INDEX	INTEGER*2(82)	The escapement year index array.

Subroutine call example :
CALL READSTRMAST(INTRAB,IERR).

Access restrictions : None.

Error condition codes : IERR = 0 No error.

IERR = 1 Invalid rabcode.

Special considerations : All returned arguments are passed through the use of a common block. Therefore, in order for this routine to work, the calling routine should contain the following Fortran statement:

```
INCLUDE 'SSA:[SALMON.ESC.LIB]STREAMCOM.FOR'
```

Readbc16

Source file name : READBC16

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :

Supplied internal rabcode and year (yy), this routine reads the BC16yy.DAT file and retrieves all the information reported on the Annual Report of Salmon Streams and Spawning Populations form for that stream in that year.

Arguments Passed :

INTRAB	CHARACTER*21	The internal rabcode.
YEAR	INTEGER*4	The year.

Arguments Returned :

ESCAPE	INTEGER*4(5)	The estimated escapements.
MONTHS	LOGICAL*1(22)	The months of arrival, start ,peak, and end of spawning for each species
DAYS	LOGICAL*1(22)	The assocaited days.
NUMINSP	INTEGER*4	The number of times the stream was inspected.
NUMOFOBS	LOGICAL*1(5)	The number of inspections on which each species was observed.
METHODS	CHARACTER*5(5)	The enumeration methods used.
RELIAB	CHARACTER*1(5)	The reliabilities of the estimated escapements.
OPTIMUM	INTEGER*4(5)	The optimum escapements.
JACKFLAG	LOGICAL*1	Binary flag indicating the presence or absence of jacks.
RUNFLAG	LOGICAL*1	Binary flag indicating the presence or absence of additional runs.

BROODFLAG	LOGICAL*1	Binary flag indicating whether brood stock has been taken.
SPAREFLAGS	LOGICAL*1(5)	Spare flags.

Subroutine call example :
CALL READBC16(INTRAB,YEAR,IERR).

Access restrictions : None.

Error condition codes : IERR = 0 No error.

IERR = 1 Invalid rabcode.

IERR = 2 Invalid year.

Special considerations : All returned arguments are passed through the use of a common block. Therefore, in order for this routine to work, the calling routine should contain the following Fortran statement:

```
INCLUDE 'SSA:[SALMON.ESC.LIB]BC16COM.FOR'
```

Clearreportcom

Source file name : CLEARREPORTCOM

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Clears the common block arrays used in escapement report generation.

Arguments Passed : None.

Arguments Returned : None.

Subroutine call example :

```
CALL CLEARREPORTCOM
```

Access restrictions : None.

Error condition codes : None.

Special considerations : The following variables are initialized:

```
RABARRAY  (2000,5,40)      CHARACTER*27....Rabcode array.
GAZARRAY  (2000,5,40)      CHARACTER*30....Gazetted name array.
LOC1ARRAY (2000,5,40)      CHARACTER*30....First local name array.
LOC2ARRAY (2000,5,40)      CHARACTER*30....Second local name array.
SUBDARRAY (2000,5,40)      CHARACTER*4.....Subdistrict array.
ESCARRAY  (2000,5,40)      INTEGER*4.......Escapement array.
```

In order for this routine to be effective, the calling routine should have the following include statement:

```
INCLUDE 'SSA:[SALMON.ESC.LIB]REPORTCOM.FOR'
```

Removedash

Source file name : REMOVEDASH

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Given a rabcode, this routine builds an internal rabcode having all dashes removed.

Arguments Passed :

EXTRAB	CHARACTER*27.....	The rabcode with dashes. (the external rabcode)

Arguments Returned :

INTRAB	CHARACTER*21.....	The rabcode with all dashes removed. (the internal rabcode)
RABLENGTH	INTEGER*4.....	The number of non-blank characters in the external rabcode.

Subroutine call example :

```
CALL REMOVEDASH (EXTRAB,INTRAB,RABLENGTH,IERR)
```

Access restrictions : None.

Error condition codes :

IERR = 0	No error.
IERR = 1	External rabcode has too few characters.
IERR = 2	Invalid character in the external rabcode.

Insertdash

Source file name : INSERTDASH

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Given an internal rabcode, this routine returns a rabcode with dashes added to denote hierarchical levels.

Arguments Passed :

INTRAB	CHARACTER*21.....	The rabcode with all dashes removed (the internal rabcode).

Arguments Returned :

EXTRAB	CHARACTER*27.....	The rabcode with dashes added (the external rabcode).

Subroutine call example :

```
CALL INSERTDASH (INTRAB,EXTRAB,IERR)
```

Access restrictions : None.

Error condition codes :

IERR = 0	No error.
IERR = 1	Internal rabcode has too few characters.

Onerabesc

Source file name : ONERABESC

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Given a rabcode and starting and ending years, this routine returns escapements for all species in the given year range.

Arguments Passed :

EXTRAB	CHARACTER*27.....	The 27 character external rabcode.
ISTARTYR	INTEGER*4.....	The starting year.
IENDYR	INTEGER*4.....	The ending year.

Arguments Returned :

JESC	INTEGER*4(5,40)...	The array of escapements (species * years).

Subroutine call example :

```
CALL ONERABESC (EXTRAB,ISTARTYR,IENDYR,JESC,IERR)
```

Access restrictions : None.

Error condition codes : IERR = 0 No error.

IERR = 1 Invalid rabcode.

Fndallstr

Source file name : FNDALLSTR

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Given a stream name, this routine returns all rabcodes, creek aliases, and associated subdistricts of creeks in the escapement stream master having this name as a gazetted or local name.

Arguments Passed :

NAME	CHARACTER*30.....	The stream name used for searching.

Arguments Returned :

RABCODES	CHARACTER*27(30)..	Array of rabcodes having a stream name match.
GAZNAME	CHARACTER*30(30)..	Associated array of gazetted names.
LOCNAME1	CHARACTER*30(30)..	Associated array of first local names.
LOCNAME2	CHARACTER*30(30)..	Associated array of second local names.
SUBDARRAY	CHARACTER*4(30)...	Associated array of subdistricts.
STRKOUNT	INTEGER*4.....	Number of streams that have a name match
LKOUNT	INTEGER*4.....	Number of streams that have only a local name match.

Subroutine call example :

```
CALL FNDALLSTR (NAME,RABCODES,GAZNAME,LOCNAME1,
                LOCNAME2,SUBDARRAY,STRKOUNT,LKOUNT,IERR)
```

Access restrictions : None.

Error condition codes : IERR = 0 No error.
IERR = 1 No stream name matches.

Getsubdstrs

Source file name : GETSUBDSTRS

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Given statistical area, this routine returns the rabcodes and names of all streams in that statistical area, together with a total stream count.

Arguments Passed :

SUBD	CHARACTER*4.....	The statistical area.

Arguments Returned :

RABCODES	CHARACTER*27(175)...	The array of rabcodes of streams in the statistical area.
GNAME	CHARACTER*30(175)...	The associated gazetted name array.
LNAME1	CHARACTER*30(175)...	The associated first local name array.
LNAME2	CHARACTER*30(175)...	The associated second local name array.
STRKOUNT	INTEGER*4.....	The total number of salmon streams in the statistical area.

Subroutine call example :

```
CALL GETSUBDSTRS (SUBD,RABCODES,GNAME,LNAME1,LNAME2,STRKOUNT)
```

Access restrictions : None.

Error condition codes : IERR = 0 No error.

IERR = 1 Invalid subdistrict.

Subdesc

Source file name : SUBDESC

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :

Given a statistical area and a year, this routine returns the total escapements for all species.

Arguments Passed :

SUBD	CHARACTER*4.....	The statistical area.
IYEAR	INTEGER*4.....	The year.

Arguments Returned :

IESC	INTEGER*4(5).....	The total escapements for all species.

Subroutine call example :

```
CALL SUBDESC (SUBD,IYEAR,IESC,IERR)
```

Access restrictions : None.

Error condition codes :

IERR = 0	No error.
IERR = 1	Invalid subdistrict.
IERR = 2	Invalid year.

Inspections

Source file name : INSPECTIONS

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Given a rabcode, this routine returns
the year the stream was first inspected,
the years inspected, the years not inspected,
the total number of years inspected and the
total number of years not inspected.

Arguments Passed :

EXTRAB	CHARACTER*27.....	The external rabcode of the stream.

Arguments Returned :

STARTYR	INTEGER*4.....	The year the stream was first inspected.
INSPARR	INTEGER*4(40).....	Array of years the stream was inspected.
NOTINSPARR	INTEGER*4(40).....	Array of years the stream was not inspected.
NUMYRSINSP	INTEGER*4.....	The number of years inspected.
NUMYRSNOT	INTEGER*4.....	The number of years not inspected.

Subroutine call example :

```
CALL INSPECTIONS (EXTRAB,STARTYR,INSPARR,
                  NOTINSPARR,NUMYRSINSP,NUMYRSNOT)
```

Access restrictions : None.

Error condition codes : IERR = 0 No error.

IERR = 1 Invalid rabcode.

Getmethods

Source file name : GETMETHODS

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Given a rabcode and starting and ending years, this routine returns the methods used to enumerate escapements, by year (all species).

Arguments Passed :

EXTRAB	CHARACTER*27.....	The external rabcode of the stream.
STARTYR	INTEGER*4.....	The starting year.
ENDYR	INTEGER*4.....	The ending year.

Arguments Returned :

ENUMERATED	CHARACTER*5(40,5)..	Array of enumeration methods by year and species.

Subroutine call example :

```
CALL GETMETHODS (EXTRAB,STARTYR,ENDYR,ENUMERATED,
                 IERR)
```

Access restrictions : None.

Error condition codes : IERR = 0 No error.

IERR = 1 Invalid rabcode.

IERR = 2 Invalid year.

Getoptimum

Source file name : GETOPTIMUM

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Given a rabcode, this routine returns the optimum escapements to this stream for all species.

Arguments Passed :
EXTRAB CHARACTER*27.....The external rabcode of the stream.

Arguments Returned :
OPTESC INTEGER*4(5).....Array of optimum escapements.

Subroutine call example :
CALL GETOPTIMUM (EXTRAB,OPTESC,IERR)

Access restrictions : None.

Error condition codes : IERR = 0 No error.

IERR = 1 Invalid rabcode.

Cycles

Source file name : CYCLES

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :

Given an array of rabcodes, a starting year, a cycle length and a species, this routine returns escapements for the maximum number of cycles.

Arguments Passed :

RABCODES	CHARACTER*27....	Array of external rabcodes.
STARTYR	INTEGER*4.....	The starting year.
CYCLELEN	INTEGER*4.....	The cycle length.
SPECNUM	INTEGER*4.....	The species number. (1 - Sockeye, 2-Coho, 3 - Pink, 4 - Chum, 5 - Chinook).

Arguments Returned :

CYCLEESC	INTEGER*4(200,5).	Array of cyclic escapements by rabcode and year.

Subroutine call example :

```
CALL CYCLES (RABCODES,STARTYR,CYCLELEN,SPECNUM,
             CYCLEESC,IERR)
```

Access restrictions : None.

Error condition codes :

IERR = 0	No error.
IERR = 1	Invalid rabcode.
IERR = 2	Invalid starting year.
IERR = 3	Invalid cycle length.
IERR = 4	Invalid species number.

Spawndates

Source file name : SPAWNDATES

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Given a rabcode and starting and ending years, this routine returns arrival, start, peak and end of spawning dates (all species).

Arguments Passed :

RABCODE	CHARACTER*27	The external rabcode.
STARTYR	INTEGER*4	The starting year.
ENDYR	INTEGER*4	The ending year.

Arguments Returned :

TIMING	CHARACTER*5(40,24)	Array of arrival, start, peak, and end of spawning dates.

Array interpretation
TIMING(1,1) - Arrival of sockeye in starting year.
TIMING(1,2) - Start of sockeye spawning in start year.
TIMING(1,3) - Peak of sockeye spawning in starting year
TIMING(1,4) - End of sockeye spawning in starting year.
TIMING(1,5) - Arrival of coho in starting year.
TIMING(1,9) - Arrival of pink in starting year.
TIMING(1,13)- Arrival of chum in starting year.
TIMING(1,17)- Arrival of chinook in starting year.
TIMING(2,1) - Arrival of sockeye in (starting year + 1)

Subroutine call example :

```
CALL SPAWNDATES (RABCODE,STARTYR,ENDYR,TIMING,IERR)
```

Access restrictions : None.

Error condition codes :

IERR - 0	No error.
IERR - 1	Invalid rabcode.
IERR - 2	Invalid year.

Maxmin

Source file name : MAXMIN

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :

Given an array of rabcodes and starting and ending years, this routine returns the maximum escapements, the minimum escapements, and the average escapements over the range of years specified by rabcode and year.

Arguments Passed :

RABCODES	CHARACTER*27(200).Array of rabcodes.
STARTYR	INTEGER*4.....The starting year.
ENDYR	INTEGER*4.....The ending year.

Arguments Returned :

MAXESC	INTEGER*4(200,5)..The maximum escapements.
MINESC	INTEGER*4(200,5)..The minimum escapements.
AVGESC	INTEGER*4(200,5)..The average escapements.

Subroutine call example :

```
CALL MAXMIN (RABCODES,STARTYR,ENDYR,MAXESC,
             MINESC,AVGESC,IERR)
```

Access restrictions : None.

Error condition codes :

IERR = 0	No error.
IERR = 1	Invalid rabcode.
IERR = 2	Invalid year.

Validsubd

Source file name : VALIDSUBD

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Routine that determines the validity of a subdistrict code.

Arguments Passed :

SUBD	CHARACTER*4.....Subdistrict code.

Arguments Returned :

IERR	INTEGER*4.....Error flag.

Subroutine call example :
CALL VALIDSUBD (SUBD,IERR).

Access restrictions : None.

Error condition codes :

IERR = 0	No error.
IERR = 1	Invalid subdistrict.

Getdistrict

Source file name : GETDISTRICT

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Given a subdistrict, this routine returns the name and number of the conservation district in which that subdistrict is located.

Arguments Passed :

SUBD	CHARACTER*4.....Subdistrict code.

Arguments Returned :

DISTRICT	INTEGER*4.....District code.
DISTNAME	CHARACTER*25.....District name.
IERR	INTEGER*4.....Error flag.

Subroutine call example :
CALL GETDISTRICT (SUBD,DISTRICT,DISTNAME,IERR).

Access restrictions : None.

Error condition codes :

IERR = 0	No error.
IERR = 1	Invalid subdistrict.

Checkrab

Source file name : CHECKRAB

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :
Given an external rabcode, this routine will determine if the rabcode is currently resident on the escapement stream master.

Arguments Passed :
EXTRAB CHARACTER*27.....The external rabcode.

Arguments Returned :
IERR INTEGER*4.....The error flag.

Subroutine call example :
```
CALL CHECKRAB (EXTRAB,IERR)
```

Access restrictions : None.

Error condition codes : IERR = 0 No error.

IERR = 1 Invalid rabcode.

Calcavg

Source file name : CALCAVG

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :

Given rabcodes, starting year, and averaging period, this routine will return escapement averages for the maximum number of periods. (max. # periods = the largest integer less than or equal to the (current year-starting year+1)/(averaging period))

Arguments Passed :

RABCODES	INTEGER*4(200).....	Array of external rabcodes.
YEAR	INTEGER*4.....	The starting year.
AVGPERIOD	INTEGER*4.....	The averaging period.

Arguments Returned :

AVGESC	INTEGER*4(200,40,5).	The escapement averages.
IERR	INTEGER*4.....	The error flag.

Subroutine call example :

```
CALL CALCAVG (RABCODES,YEAR,AVGPERIOD,AVGESC,IERR)
```

Access restrictions : None.

Error condition codes :

IERR = 0	No error.
IERR = 1	Invalid rabcode.
IERR = 2	Invalid year.
IERR = 3	Invalid averaging period.

Gettribs

Source file name : GETTRIBS

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :

Given a rabcode, this routine will return the gazetted name, local names, and subdistricts of all streams that are tributary.

Arguments Passed :

EXTRAB	CHARACTER*27.....	The external rabcode that represents the receiving waters.

Arguments Returned :

RABCODES	CHARACTER*27(200)...	Array of rabcodes of streams that are tributary.
GAZNAME	CHARACTER*30(200)...	Array of gazetted names of streams that are tributary.
LOCNAME1	CHARACTER*30(200)...	Array of first local names of streams that are tributary.
LOCNAME2	CHARACTER*30(200)...	Array of second local names of streams that are tributary.
SUBDISTRICT	CHARACTER*4(200)....	Array of subdistricts.
IERR	INTEGER*4.....	The error flag.

Subroutine call example :

```
CALL GETTRIBS (EXTRAB,RABCODES,GAZNAME,LOCNAME1,LOCNAME2,
               SUBDISTRICT,IERR)
```

Access restrictions : None.

Error condition codes :

IERR = 0	No error.
IERR = 1	Invalid rabcode.

Getrangerabs

Source file name : GETRANGERABS

Disk : [Directory] : SSA:[SALMON.ESC]

Program Language : FORTRAN

Purpose of Subroutine :

Given a starting and an ending rabcode, this routine will return the gazetted name, local names, and subdistricts of all streams whose rabcodes fall inclusively within this rabcode range.

Arguments Passed :

EXTRAB1	CHARACTER*27.....	The external rabcode representing the starting point of the rabcode range.
EXTRAB2	CHARACTER*27.....	The external rabcode representing the ending point of the rabcode range.

Arguments Returned :

RABCODES	CHARACTER*27(200)...	Array of rabcodes of streams that fall within the range.
GAZNAME	CHARACTER*30(200)...	Array of gazetted names of streams that fall within the range.
LOCNAME1	CHARACTER*30(200)...	Array of first local names of streams that fall within the range.
LOCNAME2	CHARACTER*30(200)...	Array of second local names of streams that fall within the range.
SUBDISTRICT	CHARACTER*4(200)...	Array of subdistricts of streams that fall within the range.
IERR	INTEGER*4.....	The error flag.

Subroutine call example :

```
CALL GETRANGERABS (EXTRAB1,EXTRAB2,RABCODES,GAZNAME,
                   LOCNAME1,LOCNAME2,SUBDISTRICT,IERR)
```

Access restrictions : None.

Error condition codes :

IERR = 0	No error.
IERR = 1	Invalid rabcode.

APPENDIX A ESCAPEMENT FILES

Five file structures are used in SEDS namely:

A.1 STREAM MASTER FILE

This file, STREAM.DAT, consists of all B.C. salmon spawning streams inspected by Departmental field staff since 1953. It is an indexed file using 5 keys and consists of fixed-length 280 byte records. Figure A.1 shows the format of the Stream Master file.

A.1.1 File Structure

Field Description	Format/Maximum Size
1) Internal Rabcode (Primary key)	21 characters
2) Gazetted Name (1st alternate key)	30 characters
3) First Local Name (2nd alternate key)	30 characters
4) Second Local Name (3rd alternate key)	30 characters
5) Subdistrict (4th alternate key)	4 characters
6) Status	1 digit
7) Year Index	53 2-digit fields

Figure A.1. Format of the Stream Master file.

A.1.2 Field Descriptions

Internal Rabcode - The 21 character internal representation of the 27 character stream identifying code. (see Chapter 3.1).

Gazetted Name - The official geographical name (maximum of 30 characters), as approved by the Canadian Permanent Committee on Geographical Names, as found in the Gazetteer of Canada: British Columbia

First Local Name - Not an officially approved geographical name but an alias in common use (maximum of 30 characters).

Second Local Name - A second alias in common use (maximum of 30 characters).

Subdistrict - One of 46 subdivisions (Figure 0.2) of the 9 British Columbian conservation districts (Figure 0.3).

Status - A 1-digit code that indicates whether the stream is currently being inspected (0=ACTIVE) or is no longer being inspected (1=INACTIVE). A stream is deemed ACTIVE if an escapement > 0 has been recorded in the last 3 years.

Year Index - A 53 element integer array whose index is in 1-1 correspondence with the years 1948 thru 2000.

```
Index: 1    2                          52    53
       ^    ^                          ^     ^
       |    |                          |     |
     1948 1949                       1999  2000
```

The value of an array element is either 0 indicating no escapement record for that stream in that year or is greater than 0, in which case the value is the record# to be used in a relative read of that escapement year file (see section A.2).

A.2 ANNUAL BC16 ESCAPEMENT FILES

These files contain all the information, other than comments, that appear on the Annual Report of Salmon Streams and Spawning Popoulations, one file for each year. They are relative files and consist of fixed length 160 byte records. Their filenames are of the form BC16yy.DAT, where yy is the 2-digit escapement year. Figure A.2 shows the format of a BC16yy.DAT file.

Access to a particular record occurs in two phases. Once the rabcode and year (yy) are known, the stream master file is accessed and the appropriate escapement year index value is examined. If it is 0, no escapement record exists for that stream in that year. Otherwise, its value is used as the record number in a relative read of the BC16yy.DAT file.

For example, suppose one wanted to retrieve the escapements to the Kispiox River (Rabcode = 47-0000) in 1982. The Fortran statement to read the stream master file would be:

```
READ (22,KEY=Intrab,KEYID=0) Intrab,Gazname,Local1,Local2,Subd,Status,
                             (Index(I),I=1,53)
```

If Index(Year-47) = Index(35) is equal to zero, no escapement record is on file for the Kispiox River in 1982. Otherwise, the value of Index(35) is used as the record number in a relative read of the file BC1682.DAT. The Fortran statement to retrieve the escapement information would be:

```
READ (30,REC=Index(35)) (Escape(J),J=1,5),(Months(J),J=1,22),
                        (Days(J),J=1,22),(Numofobs(J),J=1,5),
                        (Methods(J),J=1,5),(Reliab(J),J=1,5),
                        (Optimum(J),J=1,5),Jackflag,Runflag,
                        Broodflag,Spareflags
```

A.2.1 File Structure

Field Description	Format/Maximum Size
1) Estimated Escapement	5 8-DIGIT fields
2) Months	22 2-DIGIT fields
3) Days	22 2-DIGIT fields
4) Number of Observations	5 2-DIGIT fields
5) Methods of enumeration	5 5-CHARACTER fields
6) Reliability of estimate	5 1-CHARACTER fields
7) Optimum escapement	5 8-DIGIT fields
8) Jackflag	1 1-DIGIT field
9) Runflag	1 1-DIGIT field
10) Broodflag	1 1-DIGIT field
11) Spareflags	5 1-DIGIT fields

Figure A.2. Format of the BC16yy.DAT files.

A.2.2 Field Descriptions

1) **Estimated Escapement** - A 5 element integer array that contains the estimated annual escapement by species. If the estimate is negative, the following interpretation should be taken:

INTERPRETATION:

-1 = None Observed
-2 = Unknown
-3 = No BC16 file on record

2) **Months** - A 22 element integer array that contains the months the stream was first and last inspected, and by species, the arrival time in the stream and the start, peak and end of spawning.

INTERPRETATION:

MONTH(1) = Month Stream was First Inspected
MONTH(2) = Month Stream was Last Inspected
MONTH(3) = Month of Arrival in Stream (sockeye)
MONTH(4) = Start of Spawning Month (sockeye)
MONTH(5) = Peak of Spawning Month (sockeye)
MONTH(6) = End of Spawning Month (sockeye)

-Repeat for coho, pink, chum, chinook

3) **Days** - the associated 22 element array that contains the day of the month.

4) **Number of observations** - a 5 element integer array that contains the number of inspections on which the species was actually observed. (Note: The number of observations cannot exceed the total number of times the creek was inspected during the year)

5) Methods of enumeration - a 5 element character array that contains 1 character codes that indicate the methods used for spawner enumeration.

INTERPRETATION:

A - Fixed Wing aircraft
B - Helicopter
C - Streambank
D - Boat
E - Fence
F - Stream walk
G - Other

6) Reliability of estimate - A 5 element character array that contains 1 character codes that reflect the degree of confidence assigned to the estimated escapements, based on enumeration conditions and the number of stream visits.

INTERPRETATION:

A - High
B - Average
C - Low

7) Optimum escapement - A 5 element integer array containing the optimum escapements to the stream.

8) Jackflag - A 1 digit code that indicates whether jacks were reported for any species (0 = No jacks, 1 = Jacks reported for at least one species).

9) RunFlag - A 1 digit code that indicates whether an additional run of any species occurred (0 = No additional run, 1 = An additional run of at least 1 species).

If a second, third, or fourth run occurs, the information is stored in a file called ADDRUN.DAT and runflag is set to 1. The ADDRUN.DAT file contains additional run information for all streams and all years and is different from a BC16yy.DAT file (i.e., a Run 1 file) in that only species which have an additional run are carried. The file consists of fixed-length 80 byte records. Each record is keyed on the composite of run#, species, year and internal rabcode. (e.g., a 25 BYTE KEY = RUN#//SPECIES//YEAR//RABCODE which has the format as shown in Figure A.3).

Field Description	Format/Maximum Size
1) RUN NUMBER	1 digit
2) SPECIES NUMBER	1 character
3) YEAR	2 digits
4) RABCODE	21 characters
5) ARRIVAL AT CREEK	5 characters
6) START OF SPAWNING	5 characters
7) PEAK OF SPAWNING	5 characters
8) END OF SPAWNING	5 characters
9) NUMBER OF OBSERVATIONS	2 digits
10) METHODS	5 characters
11) RELIABILITY OF EST.	1 character
12) ESCAPEMENT ESTIMATE	8 digits
13) OPTIMUM ESCAPEMENT	8 digits

Figure A.3. Format of the Additional Run file.

For example, suppose the Nadina River (Rabcode = 07-0000) had a second run of chinook in 1989. The key of access to the additional run file is determined by the following :

a) **RUN#** = 2 (the second run)
b) **SPECIES#** = 5 (1=Sockeye, 2=Coho, 3=Pink, 4=Chum, 5=Chinook)
c) **YEAR** = 89
d) **INTRAB** = 070000 (internal rabcode 070000 obtained from the external rabcode 07-0000 by removing all dashes)

The key used to read information from the ADDRUN.DAT file would be constructed by concatenating the run#, species#, year, and internal rabcode. For this example the key is: RUN#//SPECIES#//YEAR//INTRAB = 2//5//89//070000 = 2589070000.

If a third run of chinook occurred in 1989 for the Nadina River, the information would again be stored in the ADDRUN.DAT file. The only difference in the key of access would be in the RUN#, a 3 instead of a 2. The key used to access this third run of chinook would be 3589070000.

10) **Broodflag** - A 1 digit code that indicates whether brood stock was taken for any species (0 = No brood stock taken, 1 = brood stock taken for at least one species).

11) **Spareflags** - Five spare 1 digit fields.

A.3 SUBDISTRICT ROLLUP FILE

This file, ROLLUP.DAT, is a relative file containing 58 records for each year of BC16 data, from 1948 to the present. The file consists of fixed-length 24 byte records. Each record contains 5 integers representing the total species escapements to a given area. Order of escapements within each record is sockeye, coho ,pink, chum, chinook.

Example: The 581st record in the rollup file is the 1st record in the 11th year block. (i.e., 581/58 = 10 + 1)

(Year block-1) (Record position within year block)

The record position within year block indicates which subdistrict is being addressed and represents the index in the subdistrict index table (Figure A.4). In this example, the first record in the 11th year block contains the 1948 + (year block-1) = 1948 + 10 = 1958 total escapements to the subdistrict that has index = 1, namely subdistrict 01.

INDEX	SUBD
1	01
2	2E
3	2W
4	3A
5	3B
6	4A
7	4B
8	4C
9	40
10	05
11	06
12	07
13	08
14	09
15	10
16	11
17	12
18	13
19	14N
20	14S
21	15
22	16
23	17

INDEX	SUBD
24	18
25	19
26	20
27	21
28	22
29	23
30	24
31	25
32	26
33	27
34	28A
35	28B
36	29B
37	29C
38	29D
39	29E
40	29F
41	29G
42	29H
43	29I
44	29J
45	29K

Figure A.4. Subdistrict index table.

A.4 STREAM HISTORY FILE

This file, HISTORY.DAT, contains information that is useful in examining a stream's escapement history. Information such as:

1) the years that the stream was not inspected
2) the highest recorded escapements
3) the most recent 10 year averages
4) the importance (rank) within subdistrict

It is an indexed file using the internal rabcode as key, consists of fixed-length 520 byte records, and has the format as shown in Figure A.5. (Note: For a more detailed description of each field, see section 5.8).

A.4.1 File Structure

Field Description	Format/Maximum Size
1) Rabcode	1 21-character field
2) Stream Status	1 1-character field
3) Species Present	5 1-character fields
4) First Year of Inspection	1 2-character field
5) Last Year of Inspection	1 2-character field
6) Years not Inspected	1 47-character field
7) Average Escapement	5 7-character fields
8) First Year of Average Escapement	1 2-character field
9) Last Year of Average Escapement	1 2-character field
10) Highest recorded Escapements	5 7-character fields
11) Rank in subdistrict	5 4-character fields
12) Percentage of subdistrict escapement	5 6-character fields
13) Number of Subdistrict Streams with positive escapements	1 4-character field
14) Arrival, Start, Peak, and End months	20 3-character fields
15) Arrival, Start, Peak, and End days	20 2-character fields
16) Years of highest recorded escapement	5 2-character fields
17) Number of streams inspected in B.C.	1 4-character field
18) Most recent escapements	5 8-character fields

Figure A.5. Stream history file format.

A.5 ESCAPEMENTS ONLY FILE

This file, ESCONLY.DAT, contains all the escapement estimates for all streams and all years. It is an indexed file using the composite of species number and internal rabcode as key, consists of fixed-length 1600 byte records and has the format as shown in Figure A.6. Each stream in the Stream Master file has five records in the ESCONLY.DAT file, one for each of sockeye, coho, pink, chum, and chinook. Each record contains 40 integers, corresponding to the annual escapement estimates for that species in that stream, starting with the year 1953. (Note: The annual escapement estimates in this file represent all runs combined).

A.5.1 File Structure

Field Description	Format/Maximum Size
1) Species Number	1 1 character field
2) Rabcode	1 21 character field
3) Escapements	40 8 digit fields

Figure A.6. Escapements only file format.

APPENDIX B COMMON BLOCKS

B.1 INTRODUCTION

The Salmon Escapement Database System consists of three labelled common blocks:

1) SSA:[SALMON.ESC.LIB]STREAMCOM.FOR - the stream master common block.

2) SSA:[SALMON.ESC.LIB]BC16COM.FOR - the annual report common block.

3) SSA:[SALMON.ESC.LIB]REPORTCOM.FOR - the report generator common block.

B.2 STREAM MASTER COMMON BLOCK : SSA:[SALMON.ESC.LIB]STREAMCOM.FOR

This common block contains all the information in one stream master file record.

```
Character*1     Status          !Stream Status
Character*4     Subd            !Subdistrict
Character*21    Intrab          !Internal rabcode
Character*30    Gazname         !Gazetted name of the stream
Character*30    Local1          !First local name of the stream
Character*30    Local2          !Second local name of the stream

Integer*2       Index(53)       !Escapement year relative record
                                 index array

Common /Streamcom/Intrab, Gazname, Local1, Local2, Subd, Status,
                  Index
```

B.3 BC16 COMMON BLOCK : SSA:[SALMON.ESC.LIB]BC16COM.FOR

This common block contains all the information in one BC16yy.dat file record, where yy is a 2-digit year.

```
Character*1     Reliab(5)       !Reliabilities of escapement
                                 estimates
Character*5     Methods(5)      !Enumeration methods used

Integer*4       Escape(5)       !Estimated escapements
Integer*4       Optimum(5)      !Optimum escapements
Integer*4       Numinsp         !Number of times the stream was
                                 inspected

Logical*1       Jackflag        !Binary flag indicating the presence
                                 or absence of jacks
```

```
Logical*1          Runflag           !Binary flag indicating
                                      presence or absence of
                                      additional runs
Logical*1          Broodflag         !Binary flag indicating
                                      if brood stock was taken
Logical*1          Spareflags(5)     !Spare flags
Logical*1          Months(22)        !Months of arrival, start,
                                      peak, and end of spawning
Logical*1          Days(22)          !Days of arrival, start, peak,
                                      and end of spawning
Logical*1          Numofobs(5)       !Number of inspections each
                                      species was observed

Common /Bc16com/Escape, Months, Days, Numinsp, Numofobs, Methods,
                Reliab, Optimum, Jackflag, Runflag, Broodflag,
                Spareflags
```

B.4 REPORT GENERATOR COMMON BLOCK : SSA:[SALMON.ESC.LIB]REPORTCOM.FOR

This common block is used in report generation.

```
Character*4        Subdarray(2000)     !Subdistrict array
Character*27       Rabarray(2000)      !External rabcode
                                        array
Character*30       Gazarray(2000)      !Gazetted name array
Character*30       Loclarray(2000)     !First local name
                                        array
Character*30       Loc2array(2000)     !Second local name
                                        array
Integer*4          Escarray(2000,5,40) !Escapement estimates
                                        array

Common /Reportcom/Subdarray, Rabarray, Gazarray, Loclarray,
                  Loc2array, Escarray
```

REFERENCES

Anonymous. 1986. Fishery Officer's Guide to Consistency in the Collection, Recording, and Use of Sub-District Salmon Management Data. Revised, July,1986. Internal report prepared for the Department of Fisheries and Oceans, Pacific Region, Field Services Branch.

Fish Habitat and Information Program. 1990. Stream Summary Catalogue. Department of Fisheries and Oceans, Vancouver, B.C.

Kuhn, B.R., L.Lapi, and J.M.Hamer. 1985. An introduction to the Canadian database on marked Pacific salmonids. Can. Tech. Rep. Fish. Aquat. Sci. 1649: viii + 56p.

Serbic, G., A. Alexander, F.Y.C. Wong, and M. Birch. 1985. Index of Salmon Spawning streams of British Columbia. Can. Data. Rep. Fish. Aquat. Sci. No. 506: 115 p.

Wong, F.Y.C. 1983. Historical salmon commercial catch data system of the Fisheries Research Branch, Department of Fisheries and Oceans, Pacific Region. Can. Tech. Rep. Fish. Aquat. Sci. 1156: vi + 94p.